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VIEWS, NEWS AND INTERVIEWS.

The Edison Electric Illuminating Company of New York, last week, sent a check for $100 to Fire Commissioner Scannell for the Firemen's Pension Fund, in recognition of the good work done by the firemen at a recent fire in the company's East Fifty-seventh street branch station. The company also congratulated Commissioner Scannell on the efficiency of the department.

At the annual banquet of the Boston Electrical Club, held last week, a novel feature was introduced in the form of a long-distance telephone entertainment. About 70 electrical men sat down to the banquet, and each found at the side of his plate a telephone receiver. Suspended from the chandelier was a megaphone. During the evening, President A. B. Chandler, of the Postal Telegraph-Cable Company, sat in his parlor in Brooklyn, N. Y., and delivered an address to the club dining in Boston. Several other speeches were made, and a number of professional entertainers transmitted their humor and songs from New York to Boston.

An electrician named McDowell was killed in the sub-cellar of the Commercial Building, New York city, on February 8. While engaged in driving a 2-inch steel pipe through the retaining wall of the building under the sidewalk, a cave-in occurred, and McDowell was overwhelmed by a sudden fall of sand. The engineer of the building discovered McDowell soon after the accident occurred, but he was dead. None of the officials employed about the building knew that the man was at work in the sub-cellar, and it has been intimated that he was a wire-tapper endeavoring to make secret telegraph connections for bucket-shop brokers.

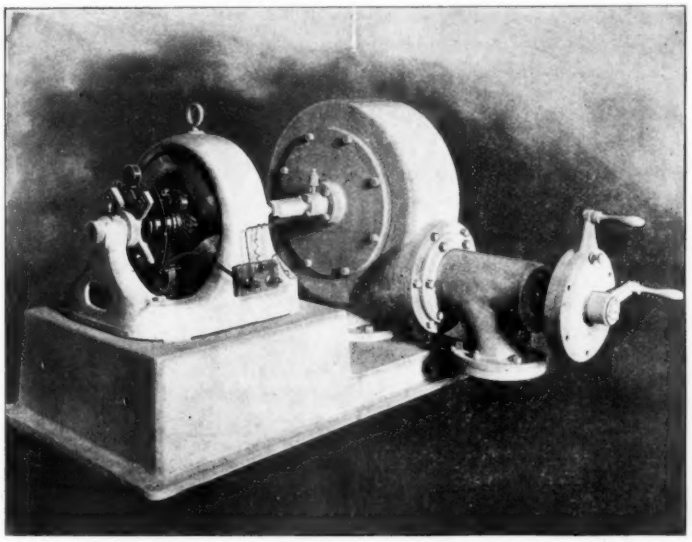
During the recent severe storm in New England, the city of Providence, R. I., had an unusually rough experience. The electric cars were unable to run for some time, the telephone service was severely crippled, and many streets were blocked, owing to the falling of overhead wires. It speaks well for the pole line construction of the Narragansett Electric Lighting Company, when it is stated that this company lost but one pole during the storm, although several breaks in their lines occurred from extraneous causes, such as poles and signs falling on them.

The oil lamps used to illuminate a part of the Fourth avenue tunnel in New York city have been supplanted with incandescent electric lights. Groups of lights containing five globes are placed at intervals of every 50 feet, while at the Thirty-eighth and Fortieth street stairways red lamps indicate the exits.

The Westinghouse Electric and Manufacturing Company, on January 31, shipped several carloads of electric machinery to the Dyea-Klondike Transportation Company, for two tramways, to be built over the Chilkoot Pass. Baggage and passengers will be hauled over the pass, and the machinery will be installed before Spring sets in.

A permit has been granted to the Citizens' Electric Company, of Brooklyn, N. Y., to lay wires to the famous Mackay mausoleum in Greenwood Cemetery for the lighting and heating of the tomb, which is now nearing completion. The wires will be laid in a trench 800 feet long. An altar is to be erected in the mausoleum, and a priest will be assigned to say a requiem mass daily.

It is said that the Italian scientist, Galileo Ferraris, at a young lady's request, wrote in her autograph album the following: "Since Maxwell has demonstrated that the vibrations of light might consist of periodical changes of electro-magnetic forces, and as Hertz has given Maxwell's theory an experimental basis with his proof of the similarity existing between electro-magnetic waves and light waves, the belief becomes more and more firmly established that this light-conveying ether and the medium in which the electric and magnetic forces act are identical. Therefore, I may well reply to the question, O studious and charming maiden, 'What is electricity?' that it is not only the fearful agent which at times lights up the heavens suddenly and startles thy soul with its loud clapping of thunder, but also the life-giving and life-awakening cause which, as light and heat, brings forth the magic of color and breath of life which transmits to thy heart the pulsations of the universe, and awakens in thy soul the charm of glance and smiles."



LIGHTING A PUMPING STATION BY WATER-POWER.

Lighting a Pumping Station by Water-Power.

The letter printed herewith relates to a practice which is believed to be new and which has much to commend it. Its principle is the use of water from a steam-pumping station as power-water for lighting the station. The economy of the plan over a separate small engine for driving the dynamo is obvious. If the water-wheel has an efficiency of 85 per cent, which can easily be reached in moderate-sized wheels of the impulse type, the plan secures a coal economy, for lighting, of 85 per cent of that obtained by the pumping engine, which latter, being of large size, and of high grade, gives a resulting economy far in excess of what could be secured by any small engine driving the dynamo direct.

The illustration herewith gives an excellent idea of the general arrangement. The handle shown at the top on the right of the illustration adjusts the nozzle to position and the handle below binds it there.

An index plate and pin will be seen in the cut, the purpose of which is to insure the correct placing of the nozzles with respect to the wheel. The impulse type of wheel has peculiar advantages for this class of work, in which the speed of the wheel must be the same as that of the machine to be driven. With a turbine, a change in size ordinarily changes the power delivered as well as the speed, and it is only by chance that a standard turbine wheel can be found to fit any given case in both speed and power. With the impulse-wheel, on the other hand, the diameter can be varied at will without changing the power delivered, so long as the nozzle remains unchanged, and in proportioning wheels for this class of work it is only necessary, in ordinary cases, to make the wheel of such diameter that when running at the number of revolutions required by the machine to be driven it shall have a peripheral speed equal to that called for by the head of water under which it operates. James Leffel & Company state that the success of this plant has led to the installation

of a similar one, but of about three times the capacity, at the Columbus, Ohio, waterworks. The letter is as follows:

"There has been no undertaking in my past experience that has given more satisfaction than this, and in fact it exceeds our expectations as to economy. As we were too far from the city electric plant to receive light from them, we concluded to put in a plant of our own, and purchased a 40-light machine—which will easily carry 50 lights—and connected it direct to a 12-inch Leffel Cascade wheel, which is connected to our main service-pipe inside the station. The discharge is piped to pump-well to obviate any waste of water. Under 70 pounds pressure—our minimum—we can run 30 lights, 16 candle-power, 110 volts, with $\frac{3}{32}$-inch jet, which gives a theoretical flow of 90 gallons per minute, making a total of 54,000 gallons in 10 hours' run, which actually cost 23 cents per thousand gallons for coal burned while pumping, as all other items, such as salaries, banking fires, etc., remain a constant, showing the exact cost to us of running 30 lights 10 hours to be 12.42 cents. Our coal costs us $1.75 per ton, delivered in shed at station. The data are based on my last year's report of the triple-expansion pumping engine.

"The Cascade motor has five different size jets—$\frac{5}{16}$-inch, $\frac{9}{16}$-inch, $\frac{3}{32}$-inch, $\frac{1}{16}$-inch and $\frac{3}{32}$-inch in diameter—made on the smooth taper plan. The nozzles are all in one brass disk, four inches thick, bored longitudinally, the disk being five inches in diameter. The jets are laid off on a circle having six spaces, one being left blank to close main opening when not in use. I enclose rough sketch to give a better idea.

"The generator is a multipolor, compound, shunt-wound machine, the speed being 890 turns per minute.

"W. C. POWELL,

"Engineer Springfield, Ohio, Waterworks."

We are indebted to the *American Machinist* for the above particulars.

A New Electric Light Station For New York City.

The Edison Electric Illuminating Company of New York has purchased the block of 22 lots in New York city, bounded by Thirty-eighth and Thirty-ninth streets, First avenue and the river, for $345,000. It is said that the company will erect on the plot one of the finest and largest electric plants in the country.

ROENTGEN-RAY NOTES.

BY WILLIAM ROLLINS.

XXIV—OTHER REASONS WHY THE VACUUM RISES.

When we keep a Roentgen light tube hot during exhaustion we have a vacuum sufficiently free from water vapor to enable us to disregard its condensation on the walls as a cause for the vacuum altering in use. After this tube has been used the vacuum rises. We can lower it again within certain limits by heating. It is also known that rest for a few weeks or months will lower a vacuum. Why should heating and rest do this? It has been said that heating drove gases out again from the substance of the glass, but I have never seen it stated that rest would do the same. Perhaps it may, but in addition to the causes mentioned in previous notes, there is another. In a vacuum tube exhausted in the ordinary way we always have oxygen as one of the residual gases. Under electric stress the molecules of this gas are smashed, and the resulting molecules, containing a greater number of so-called atoms, the number of molecules is less, and, therefore, the vacuum must be higher. Now, one of the characteristics of these new molecules is, that by heat we can decompose them into ordinary oxygen molecules, thereby increasing the number, and, therefore, heat lowers the vacuum. This change of the stress molecule back to the normal type also takes place at ordinary temperatures. If we give it time enough, therefore, rest lowers the vacuum. There comes a time, however, when with ordinary vacuums neither heat nor rest will lower them enough to be of practical use, because other means are at work raising the vacuum. The larger the proportion of oxygen molecules to those of nitrogen the longer will heat and rest prove efficient, and this is one, though a not important, reason why I have recommended this type of vacuum.

XXV—ROENTGEN LIGHT AND MOLECULAR WEIGHT.

In Note VI it was said that the wave length of Roentgen light depended upon the potential and the vacuum. In Note XVIII the fact was stated in another way—that the wave length depended upon the velocity with which the molecules struck the target. In this note the matter is looked at in a different light. With the same potential and vacuum and distance between the cathode and target, the wave length depends upon the weight of the bombarding molecules, which belong to what are generally considered two distinct classes, metallic and non-metallic. They are the molecules of the cathode and of the residual gas. Emerson has said that the atoms march in tune, and we should remember this when we wish to generate homogeneous Roentgen light, tuning our gas and metal molecules to strike the target with the same velocity, for the light we wish to produce there is simply music of the ether, with a pitch so high we can not even hear it with our eyes until, through the keener perceptions of a fluorescent screen, it is brought down to our range. The simplest way to tune the molecules of gas and metal is to fill the tube with a gas whose molecules have the same weight as those of the metal of the cathode. It is also evident that with a given potential, vacuum and distance, the lighter the molecules the higher the velocity with which they will strike the target. In other words, the lower the molecular weight the lower the potential we can use to produce Roentgen light of a given wave length. This is of importance, because with the present apparatus high potential means bulk and weight. A few of my experiments, which appear to bear on the matter of molecular weight, may be of interest. The experiments were tried in several ways, but for simplicity only one will be mentioned. A number of tubes were made alike in every respect, except that the metal of the cathodes was different. For brevity, I leave out some of the metals and consider the series as composed of aluminum, zinc, tin, platinum. A moment's consideration will show the relation of their weights and why they were selected. In all the cases with the moderate potential I used the aluminum gave the best results in light, the difference between this and platinum being marked. But, as already stated, the light also depends upon the bombardment of gas molecules, so I tried another series of experiments, arranging the gas molecules as well as I could to correspond in molecular weight with those of the metal of the cathode. For example, with aluminum I used oxygen, the molecular weights being approximately 27 and 32. To be sure, the stress molecule of oxygen has a higher weight and so strikes the target at a lower velocity, but being smashed there, power enough is generated to compensate for this.

For one experiment I selected two metals of high weight, one easily acted on by oxygen, the other with difficulty, but as there was very little difference in the results, oxidation did not seem to play an important part. The two metals were lead and platinum.

It would be interesting to try the lighter metals than magnesium for cathodes, for example beryllium, but I have never been able to get a piece big enough except for one of my target-windows.

It seems fortunate that metals of low weight are best for cathodes, because the metals of the cathodes are always deposited on the glass walls of a Roentgen light tube, in which position, if they had high atomic weights, they would interfere with the passage of the light.

XXVI—WHY HYDROGEN AND ARGON ARE UNSUITABLE WHEN THE CATHODE IS ALUMINUM.

The metal usually employed for a cathode is aluminum with a probable molecular weight of 27, while that of hydrogen is only two. According to the statement in Note XXV, the molecular weight of the cathode and gas should be as nearly alike as possible, which is not the case with aluminum and hydrogen.

Argon, with a molecular weight of about 40, does not correspond with the probable molecular weight of any metal we could conveniently use as a cathode. Moreover, as argon is simply the stress molecule of nitrogen, containing three atoms instead of two, and formed among other ways from the ordinary atmospheric nitrogen by the lightning's grand potential, we should expect to be able to decompose it in a vacuum tube, combining it with the metal of the cathode, just as ordinary nitrogen can be made to combine with magnesium, thus rendering it unfit for use with a cathode of aluminum, and explaining the blackening and other phenomena when a cathode of this metal is used with argon as the residual gas.

Under equal stress ordinary nitrogen does not produce this effect upon aluminum, and having a molecular weight of 28, almost the same as the probable molecular weight of aluminum, which is 27, it seems better adapted for use, and when mixed with oxygen, the weights stand 27, 28 and 32.

XXVII—ROENTGEN LIGHT TO DETERMINE MOLECULAR WEIGHT.

In Note XXV I suggested arranging the molecular weight of the residual gas to correspond with the

probable molecular weight of the cathode. If the statement should be proved that, with a given potential, vacuum and distance, Roentgen light depended upon molecular weight, then this method might be used to determine the probable molecular weight of those metals whose molecular structure is uncertain on account of the difficulty of applying the law of Avogadro–Ampere–Gerhardt to them.

XXVIII—BAD DEFINITION CAUSED BY DANCING OF THE RADIANT POINT.

If we tune the generator and tube together, and adjust all the conditions, we can see the radiant area on the platinum as a minute red-hot oval spot surrounded by a colored halo. To see this we must place the target as directed in a previous note, not at the theoretical, but at the real, focus of the cathode discharge.

By throwing the generator out of tune with the tube we can make the colored area dance around the red-hot spot. Of course, the whole area from which Roentgen light is being given off is moving, the red spot appearing to keep still simply because the metal does not have time to cool. It must be evident that with a moving radiant point we can not get good definition, for the shadows cast by an object in the path of the rays shift their position, producing a kind of composite photograph, made up of many images. The effect is the same as though the tube were moving during exposure. One of the most frequent causes of this movement is the lateral discharge, which takes place between the cathode and the glass walls of the tube when things are out of tune. In experimenting with different metals for cathodes in tubes otherwise alike, I found the lateral discharge most frequent with metals of the highest atomic weight. This frequently made it a matter of some care and time to compare different tubes. Lead, which has an atomic weight of 207, and, therefore, a molecular weight at least as high, was frequently deposited on the glass, thus acting as a second cathode, perhaps, and deforming the cathode stream. Of all the common metals, mentioned in a previous note, heavier than aluminum, zinc gave the least trouble and brightest light. A moment's thought will show that zinc has a molecular weight nearest to the probable molecular weight of aluminum of any of the metals mentioned in Note XXV. With an increase of the exciting current the lateral discharge became more evident, showing it was caused by the difficulty which the discharge had in escaping from the cathode in the normal direction. Even throwing the tube out of tune, by increasing the condenser capacity, was enough to bring about this result.

Weston Electric Appliance Company.

The Weston Electric Appliance Company, of Newark, N. J., has been incorporated. The capital stock is $750,000, of which $20,000 has been paid in. Edward Weston, of Newark, Franz C. Mathieson, of New York, and Henry E. Niese, of Jersey City, are the incorporators. The company, with four others of which Mr. Weston is the head, will build plants at Waverly, south of Newark, during the coming Spring.

LITERARY.

Walter A. Wyckoff, the college man who became a day laborer, begins his new series, "The Workers—The West," in *Scribner's* for March. Chicago, filled with an "army of the unemployed," is to be the subject of the bulk of this series. Each part swarms with new characters, new experiences and a variety of incident, of which the first part of "The Workers" gave no hint. It is dramatic and pathetic—and absolutely true.

The office of the New York & Ohio Company, in New York, at 1 Broadway, will hereafter be under the personal supervision of the president of the company, Mr. J. W. Peale. The New York and eastern business will be managed from this office, with the aid of several salesmen.

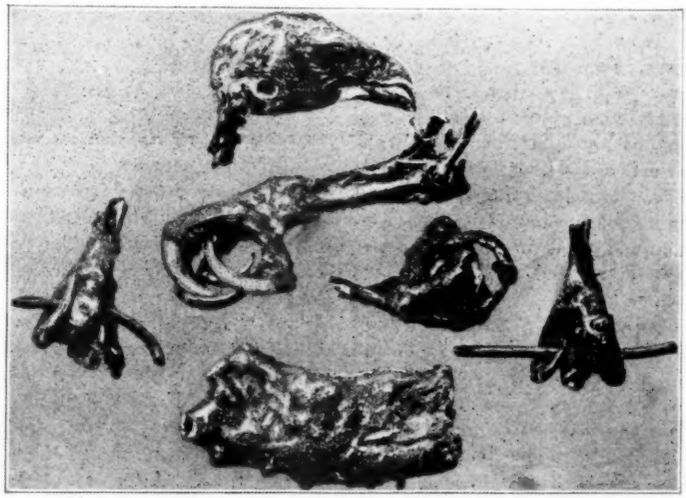
CHICAGO NOTES.

Mr. Frederick L. Merrill, for many years with the Electric Storage Battery Company, is now with the firm of Sipe & Sigler, Cleveland, looking after the interests of the Willard storage battery in the West. Mr. Merrill's long and successful career in the battery business makes him a valuable addition to Messrs. Sipe & Sigler's staff.

Harter & Company, one of the old-time electrical contracting firms in Chicago, report that construction business in this city will be more extensive than ever this year; even now, they say, hardly a day passes but a contract of some kind is closed by them. This means orders for the supply people and work for the wire men.

Farr Telephone and Construction Company's 1898 catalogue is in the hands of the printer, and from advance sheets shown, it is fair to assume that it will surpass anything ever published in that line. The Farr company's business is gradually extending to even the foreign countries, as indicated by some recent orders from Mexico, one customer in Aguascalientes ordering a private line equipment "as per your announcement in the ELECTRICAL REVIEW."

House Bill No. 31, which is announced to come before the legislature for a second reading, is pronounced by the independent telephone people as intended to work great harm to the independent movement if passed. The bill provides that after making a statement to the auditor, the person or corporation making the same shall pay a tax of $10 for each telephone connection, and $50 for each telephone device known as the telephone slot arrangement. It is claimed that the tax is too high, especially for the smaller cities, where $10 a year added to the present rates would make cheap service impossible. C. E. K.



REMAINS OF TWO EAGLES THAT PERCHED ON A CALIFORNIA TRANSMISSION LINE.

The Eagles and the Transmission Line.

In the ELECTRICAL REVIEW for January 5, 1898, appeared an article describing how two eagles which alighted on an electric transmission line in California caused their own demise and a short circuit on the line. The illustration herewith, taken from the *Journal of Electricity*, of San Francisco, shows what was left of the eagles after the accident. Our contemporary states that the generating plant of the San Joaquin Electric Company, of Fresno, Cal., was one day pumping 10,000 volts serenely into the transmission line, when suddenly one of the circuits developed a dead short circuit, with the almost instantaneous open-circuiting and grounding of the two legs of the circuit which were on the upper cross arm. This, of course, interrupted the service in Fresno, and the ground thus thrown on was so severe that it became impossible to burn it out. After a few minutes' delay the service was resumed over the second transmission line, which had remained uninjured.

Linemen were sent out at once to ascertain the cause of the trouble and repair the broken circuit, and after having gone over nearly 30 miles of line, they reached a mountain top about five miles from the power-house, where the break was discovered. As to the cause of it, there were found the scant relics of two gray eagles, consisting merely of one skull and four feet and parts of legs. Two of the talons were clutched tightly to the line wires in literal realization of the grip of death, while the remaining two feet and parts of legs were free from the marks of roasting, or rather from the burning to a crisp, that characterized the feet that clutched the wires. Not a vestige of the bodies or feathers of either bird, nor of the head of one of them, could be found; in fact, the only remains were those shown in the illustration. Another interesting specimen was found, however, which shows the terrific heat of the electric arc. The soil along the pole line at the place indicated consists of pure granitic sand, which, wherever the wire touched the ground, had become melted into glass, and even a piece of quartz had been fused and run in together with the glass. This is well shown in the specimen presented in the illustration.

The circumstance of the accident suggests a theory for it, as evidently the two eagles alighted on different legs of the three-phase circuit within close proximity to each other; that they actually came into contact, and, in so doing, formed a short circuit, which not only incinerated the eagles, but threw the wires into short circuit and burned them off.

A SUBMARINE CABLE SUCCESSFULLY LAID UNDER DIFFICULTIES.

THE FIRE ISLAND CABLE OF THE POSTAL TELEGRAPH COMPANY'S MARINE-NEWS SERVICE.

One of the most difficult jobs of submarine cable-laying undertaken in recent years was that successfully performed by the Okonite Company, Limited, for the Postal Telegraph-Cable Company on January 25. The

FIG. 1.—POSTAL TELEGRAPH-CABLE COMPANY'S MARINE OBSERVATORY AT FIRE ISLAND.

cable was the heaviest of the kind ever manufactured and laid, and reposes in Great South Bay on the ocean side of Long Island, between Fire Island and Conklin's Point, six miles away on the Long Island shore.

Every yachtsman and many others know the dangerous character of the Great South Bay owing to its constantly shifting shoals and sandbars. Only a native "bayman," and one of many years' experience at that, is a competent pilot through the devious and dangerous channels of the bay. The difficulties and responsibilities of the undertaking were such that the Postal Telegraph-Cable Company insisted upon the manufacturers of the cable laying it themselves. This the Okonite Company did with such ease and success that it reflects great credit on the careful planning and preparations necessarily made in advance.

This six-mile cable forms the most important link in the line just completed by the Postal Telegraph-Cable Company for its ship-news service. The company has recently established several marine observatories outside the port of New York for the purpose of reporting at the earliest possible moment the arrival of steamships. The most exposed and the most distantly located of these observation towers is that just completed at Fire Island. From this observatory, which is on the ocean side of Fire Island, a substantially constructed overhead land line runs to the bay side of the island where it meets one end of the submarine cable. The cable crosses the bay as mentioned above, landing at Conklin's Point. Here it connects on a terminal pole with another land line, which runs due north to the Long Island Railroad tracks. This land line is a splendid example of modern telegraph construction, and is provided with two copper wires weighing 210 pounds to the mile. From the point where the land line meets the Long Island Railroad tracks it follows an old overhead line for some miles along the railroad, then along the highways until the outskirts of Brooklyn are reached, where it goes underground to No. 4 Court street, Brooklyn, one of the Postal company's offices. From here the line runs, via an aerial cable carried on the elevated railway structure, to the Brooklyn Bridge, thence over the Brooklyn Bridge in another aerial cable to the New York terminus, whence it goes underground to the Postal company's main office, at 253 Broadway, New York city. In its course this important line passes through several townships on Long Island and three of the boroughs of Greater New York.

In order to fully understand the amount of preliminary work and planning required for the successful carrying out of this project, it will probably be as well to follow the cable on its journey from the Okonite company's manufacturing plant at Passaic, N. J., to its final resting place in the waters of the Great South Bay. The cable, as mentioned, is six miles long, was made in one length, and weighs about 65 tons. It is one inch and three-fourths in diameter, contains six Okonite wires arranged as three pairs, and is heavily armored with

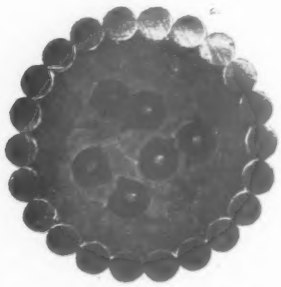
FIG. 2.—WINDING THE CABLE ON ONE OF THE REELS FOR SHIPMENT FROM THE OKONITE FACTORY.

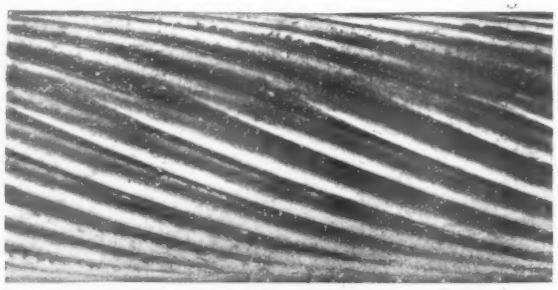
galvanized iron wire. The cable weighs four pounds to the foot, which is about five and one-half times the weight of an ordinary ocean cable. At the Okonite company's factory there is one of the largest testing tanks in the United States. The cable as manufactured was coiled in this tank, and put through the usual severe tests. After satisfactorily passing through these tests, the end of the cable was led through a window to a heavy reel erected on bearings on a flat-car alongside the factory buildings. A leather belt was passed around one end of the reel and carried through the window to a shaft in the factory. By this means the reel was turned, and the cable was wound upon it. It required three of these reels and three flat-cars to transport the cable.

From Passaic the reel-laden cars were transported by as direct railroad connection as possible to New London, Ct., where they were run out on a pier, and the cable was unwound and coiled on the deck of a large wrecking scow. The cable lay on the deck of the scow very much as it did in the testing tank at the factory.

The reason for such a roundabout road was that New London was the nearest point at which a scow of the requisite size and of sufficiently light draft could be obtained. This was made necessary owing to the shoals and sandbars in the Great South Bay, over which a heavy draft scow could not pass. Capt. T. A. Scott, the famous New London wrecker, was in charge of this part of the work, and the skill he displayed in handling the heavy mass of material was truly wonderful to an observer unaccustomed to such things. The scow was 85 feet long, 35 feet broad, and drew about three feet of water with the 65 tons of cable on its deck. The cable was passed from the reels on the cars through a heavy snatch block suspended from a derrick on the scow, and was coiled on the deck, without a kink, in six layers, containing about a mile each. This is the first time, it is believed, that a cable of such length and size has been laid in such a manner. Heretofore heavy reels have been used, with various degrees of satisfaction. The manner in which the cable was paid off from the deck of the scow in laying left no doubt in the minds of the experts who were present as to the success of this method.

When the cable was coiled down and made fast, the scow was taken in tow by a heavy, sea-going tug and towed down the Sound to a point off the Staten Island shore, where the outfit was obliged to anchor owing to heavy weather. The following day and night the journey was completed from Rockaway Inlet to Fire Island. The scow was anchored near the terminal pole of the Fire Island land line, and a heavy rope was carried ashore in a





FIGS. 3 AND 4.—FULL-SIZE END AND SIDE VIEWS OF THE OKONITE SUBMARINE CABLE LAID IN GREAT SOUTH BAY FOR THE POSTAL COMPANY.

small boat, passed through a pulley made fast to the terminal pole, and carried back to the scow. The rope was attached to one end of the cable, the other end of the rope being passed

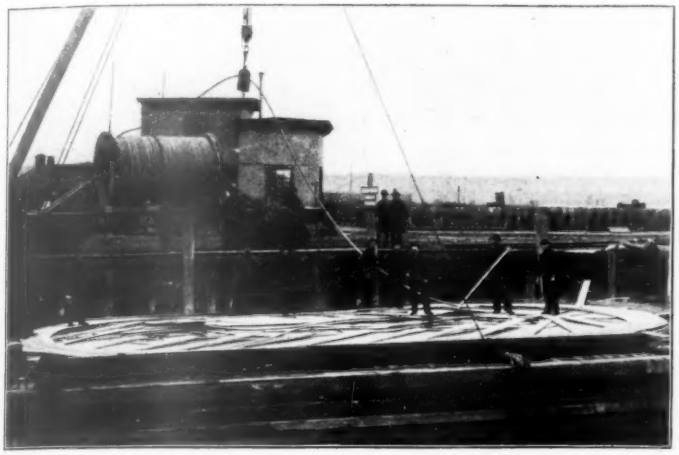


FIG. 5.—TRANSFERRING THE CABLE FROM THE REELS TO THE DECK OF THE WRECKING SCOW.

around a steam winch. In a very few minutes after the winch had started, the end of the cable was ashore, where it was made fast. A light-draft tug, drawing but four feet of water, was then made fast to the scow, and the tedious and dangerous journey across the Great South Bay was commenced. The word dangerous is used advisedly, because if the scow had gone ashore on any of the numerous sand-bars, the great weight it was carrying would have rendered it well nigh impossible to release it before the bay froze over, which was threatened at any minute.

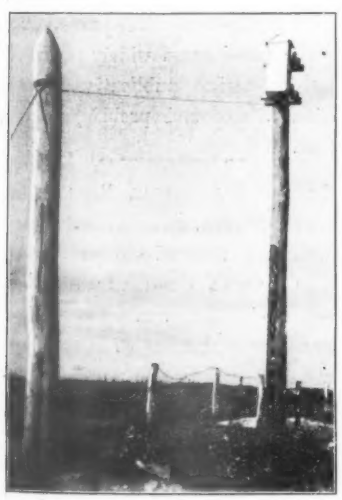


FIG. 6.—CABLE TERMINAL POLE AT CONKLIN'S POINT.

The tug was piloted by an expert bayman, Capt. George Saxton. Owing to his thorough knowledge of the channels and bars, the cable was successfully laid in the wonderfully short time of four hours, without a single hitch or delay from any cause. The cable was paid out over the stern of the scow in much the same manner as it was carried aboard. A guiding block was rigged up on the stern of the scow, through which the cable passed, and an extemporized brake was used to regulate the speed of paying out. The numerous illustrations accompanying this article will give a very clear idea of the various steps of the work.

Valuable assistance was rendered in the shipping and laying of the cable by Mr. R. D. Blish, the cable expert of the Southern New England Telephone Company, and the laying of the cable was witnessed by Mr. E. B. Baker, general superintendent of the Southern New England Telephone Company, who was greatly pleased with the methods and means used. Mr. E. G. Cochrane, general superintendent of construction for the eastern division of the Postal Telegraph-Cable Company, was present, as well as Capt. W. L. Candee and Mr. George T. Manson, of the Okonite Company.

A press dispatch from Helena, Mont., dated February 9, stated that the upper Missouri, or that part of it below Canyon Ferry, was dry on account of the dam which was completed the day before by the Helena Water and Electric Power Company, 17 miles north of Helena. A lake is being formed by the backwater of the dam, which extends seven miles up the river and covers six square miles. Meantime the river below the dam is practically dry, a child being able to ford it without danger. Men are prospecting in the river bed for gold, while others have taken out large catches of trout and other fish that have been left in the pools formed in the river bed. The dam is 34 feet high and has been built at a cost of $450,000. In a few weeks it will be furnishing water-power to generate electric current for transmission to Helena.

A Steam Engine Combination in Providence.

As mentioned in the ELECTRICAL REVIEW last week, the Rice & Sargent Engine Company, the Providence Steam Engine Company and the Builders' Iron Foundry, all of Providence, R. I., have entered into a working agreement, which is fully explained below. The Builders' Iron Foundry was established in 1822 and incorporated in 1853; the Providence Steam Engine Company was established in 1821 and incorporated in 1863; and the Rice & Sargent Engine Company was incorporated in 1894. The three companies are well known throughout the country.

Relations between the two older companies have been friendly for a great many years, although neither has been financially interested in the other. The Rice & Sargent Engine Company, since its organization, has been closely allied with the Builders' Iron Foundry (the president and treasurer of the latter having been officers of the former corporation),

FIG. 7.—METHOD OF GUIDING CABLE WHILE PAYING OUT FROM THE SCOW.

and the foundry has furnished a great deal of material and work for the engine company, but, as its shops have been occupied in finishing and assembling 12 inch breech loading rifled mortars for the United States Government, it has not been in a position to furnish all the work that the engine company required, and the companies were, accordingly, desirous of obtaining more extensive facilities. These were found in the shops of the Providence Steam Engine Company, which had recently been enlarged and equipped beyond its present requirements. That company also, owing to the death of its president and treasurer, Mr. William B. Waterman, was desirous of having some active business men take part in its management; and accordingly it was a very simple and natural arrangement that the three companies should decide to have, to a large extent, a common management. They have agreed, for a period of five years, to be operated under common officers as far as the engine companies are concerned, and two of these are also officers of the Builders' Iron Foundry. Each company will maintain its separate organization and conduct its own business as heretofore—neither being liable for the contracts or other obligations of the others.

FIG. 8.—LANDING THE SHORE END OF THE CABLE AT FIRE ISLAND.

It is anticipated that the combination will be of material advantage to each and to the customers of each, as expenses will be materially reduced and the business of each will be enlarged and carried on with more adequate facilities.

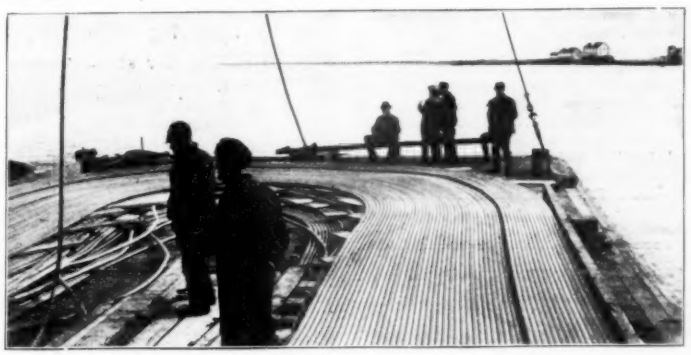


FIG. 9.—PAYING OUT THE CABLE ACROSS GREAT SOUTH BAY.

The Citizens' Power and Light Company, of Montreal, Canada, transforming house has been destroyed by fire at a loss of $100,000. The plant had been running but a few weeks.

Electrical Review

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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The recent resignation of Mr. Gustav Bissing, Chief Examiner in Electricity, Division A of the Patent Office, and the transference of Mr. D. O. Rice from the division to fill the vacancy, is causing some comment among electrical inventors, who allege that Mr. Rice is not a trained electrician.

THE USE OF TELEPHONES BY NON-SUBSCRIBERS.

At Washington, D. C., last week, Associate Justice Cox in the Supreme Court of the District of Columbia rendered a decision of interest to all telephone companies in the case of Danenhauer against the Chesapeake & Potomac Telephone Company. The plaintiff is the proprietor of a hotel in Washington, and as such was a subscriber of the telephone company, which placed one of its instruments in the hotel. The plaintiff permitted guests and patrons of the hotel to use the telephone free of charge. The company sought to prohibit this practice, and threatened to remove the telephone. The plaintiff denied their right to do this, the company began to remove the instrument, and the plaintiff obtained a temporary injunction restraining the company from interfering with his service. Arguments for and against the plaintiff's request to make the injunction permanent were heard by the court, and Justice Cox's decision makes the injunction permanent and imposes certain requirements upon the plaintiff. The order continuing the injunction states that the telephone must be used strictly for hotel business and for the private business of the proprietor. It stipulates that the plaintiff shall not allow the telephone to be used for other purposes than those mentioned. The order specifies that the telephone may be used for the benefit and accommodation of boarders, such as sending for a wagon to call for baggage, but it may not be used by them for other purposes, such as calling for stock reports or the ordering of theater tickets.

"The telephone company is obliged to maintain a special plant," says the order of the court, "and is entitled to charge for every message sent. All that the law requires is that the company shall not discriminate between its patrons, but must serve all persons on the same terms. The explicit terms of the contract made between the parties in 1896 are that the telephone be for the subscriber's use only, and on a breach of the terms the contract may be violated. When the subscriber allows others to use his telephone it is an abuse of the time of the telephone operator. It is also an infringement on the rights of the Bell Telephone Company, which receives a royalty from the defendant. Furthermore, it is an infringement of the rights of other subscribers. * * * The hotel guest is entitled to the use of the telephone in the hotel, but no one is entitled to the use of the telegraph, if the telegraph company has an instrument in the hotel. The guest does not have his telegrams sent free of charge nor does he secure the service of messengers and the use of carriages without pay. Why should he be allowed to use the telephone without paying for its use?"

According to a Washington paper, a movement is reported to be on foot on the part of a number of telephone subscribers to pool their interests and make a test case of the refusal of the company, for instance, to permit any one but a doctor or some one connected with his office using his telephone. In the face of Justice Cox's able and just decision, it would seem a waste of time to attempt such a test.

A cable dispatch from Paris to the New York *Sun* asserts that Professor Bouchard, by means of the Roentgen rays, has discovered a new movement of the heart. It is said to be a rhythmic dilation during respiration, and is not connected with the ordinary movement of the heart. It appears to arise from a diminution of pressure in the interior of the thoracic cage during inspiration.

The article on the candle-power of a 10 ampere, 45-volt arc lamp, by Prof. L. B. Marks, published on another page of this issue of the ELECTRICAL REVIEW, is worthy the careful perusal of every student of electric lighting. The much discussed question of candle-power is still far from a final settlement.

The increasing adoption of electric power for mining purposes is rapidly displacing the mine mule. He will undoubtedly within a few years join his already emancipated brother, the street-car horse.

The annual report of the Edison Electric Illuminating Company of New York, submitted to the stockholders of the company at their annual meeting on February 8, was undoubtedly a satisfactory document to them. The total net income of the company for 1897 was $1,117,497.04 as against $966,380.13 for 1896. This is one of the best managed electric lighting properties in existence.

Not content with supplying the engineering talent and a large part of the electrical apparatus required for new electric railways in England, American manufacturers have supplied steel rails for several of the new roads, notably those at Plymouth and Liverpool. Bidders for rails from several foreign countries were all below the English manufacturers, a Belgian bidder and a German bidder being also lower than the best American offer.

Just 16 years ago, on February 15, 1882, the first number of the ELECTRICAL REVIEW was published. Those of our subscribers who are fortunate enough to have a complete file of this journal will note the wonderful improvement in its bulk, appearance and quality as compared with that first issue. The growth has been steady and solid, and to-day the ELECTRICAL REVIEW makes the undisputed claim of being the most widely read and quoted electrical publication in the United States and probably in the world.

In the ELECTRICAL REVIEW for January 5, 1898, we published a story concerning the adventure of two eagles with an electric transmission line in California. It was a good story, but a number of our friends expressed, both verbally and in writing, considerable skepticism regarding it. On another page of this issue of the ELECTRICAL REVIEW will be found an illustration showing the remains of the eagles after they had tackled the transmission line. This is reproduced from a contemporary, and we consider it ample evidence of the truth of our story. We think our readers will agree with us.

Wall Street and the Electrical Stock Market.

The stock market has been dominated to a considerable extent by the uncertainty of the Cuban situation. The Spanish Minister's letter made timid holders somewhat apprehensive, a fact which was utilized by bears to depress values. On the whole, however, the market did not stay down very long, and to-day saw the highest prices for some time past, several stocks selling above the high figures of last Summer's boom. The bond market was also active and showed continued strength.

The course of the traction stocks of Greater New York attracted considerable attention. Manhattan declined steadily during the early part of the week, but recovered its loss. The marked feature, however, was Metropolitan Street Railway, which advanced from 149½ on Monday to 171¼ to-day. A number of interesting rumors circulated concerning the company, among others being one to the effect that the company may issue about 30 per cent more stock to present stockholders at a price to make a good dividend, probably at par. Inside interests state that as soon as pending litigation is settled, the Sixth and Eighth Avenue lines will be equipped with electricity. The Madison Avenue line, which was so equipped, is doing exceedingly well, and the company generally shows gratifying earnings. A contract for an electric plant for a new power-house has been let to the General Electric Company. Brooklyn Rapid Transit was fairly active, the price advancing from 39 on Tuesday to 41½ to-day, closing at 40⅝. The bull factor in the stock has been the expectations of greatly increased earnings, resulting from the running of cars on the Bridge.

General Electric declined from 39¾ on Monday to 37⅛ on Wednesday, but rallied to day, and sold as high as 39, closing at 38. Total transactions amounted to 38,000 shares. While nothing has been done in regard to an adjustment with the preferred stockholders, Wall Street is inclined to be bullish on the common stock, and purchases have been made in expectation of favorable statements of earnings. The debenture 5's were more active than for some past, $25,000 changing hands at 101¼ @ 101¾. The legal decisions of the week by the United States Circuit Court at Chicago, in the suit of C. A. Bates, who asked for the appointment of a receiver, and in the Van Depoele trolley patent case, have been favorable to the General Electric Company. In connection with the latter, it is said that, in order to avoid possible complications of litigation, George J. Gould has decided to ignore the Walker Company and divide the Manhattan contracts between the General Electric and the Westinghouse.

Western Union was rather quiet, but steady, at 91¼ to 92⅞. It is believed that the stock has been quietly absorbed during the past fortnight by strong interests who regard it as a good investment at present values.

Transactions in electrical stocks on the Philadelphia and Boston Stock Exchanges during the week were light, although closing prices showed net gains of from ¼ to 3½ points. Bell Telephone advanced from 266½ to 270, closing at the latter figure; Erie Telegraph and Telephone gained a point to 71¾, sold down to 70 and back to 71 on Friday night; General Electric preferred advanced from a bid price last Saturday of 89 offered at 90 to 90 bid, 92 asked; New England Telephone advanced 3 points to 134 on Tuesday, being quoted at 133 offered, 135 asked at the close. On the Philadelphia Exchange, Electric Storage Battery common sold at 24, the preferred at 27 to 27⅛, closing at 27 bid, offered at 29, and Pennsylvania Heat, Light and Power advanced 1 point net and closed at 22¼.

The Edison Electric Illuminating Company of New York held its annual meeting on Tuesday. The old board of directors was re-elected. The report of the company for the year ending December 31 last shows gross earnings of $2,466,256, an increase of $243,519 over 1896. The total net earnings amounted to $1,117,497, an increase of $154,899, while balance increased $154,493, making a total surplus of $503,530. After deducting from this item accounts written off and general depreciation account, which amounted to $449,719, a final balance of $53,811 remained, a decrease as compared with the year previous of $137,742. The annual report goes on to state that while no addition to the capital stock has been made in two years, the present strong position of the company has induced the directors to offer shortly to stockholders $1,200,000 of treasury stock at par, to provide funds for further extensions.

RAY.

Wall Street, February 11.

Taber & Mayer, the well known manufacturers of telephones, have removed their office and factory to 506 Atlantic avenue, Boston.

Partial List of Exhibitors at the Electrical Exposition.

Below will be found a partial list of exhibitors who have contracted for space at the Second Electrical and Kindred Industries Exhibition, to be held in Madison Square Garden, New York city, next May. The management states that the number of companies which have already secured space is over five times as many as had been secured at a corresponding date before the last show.

Armorite Interior Conduit Co., Pittsburgh, Pa.
American Rheostat Co., Milwaukee, Wis.
American Electric Cold Supply Co., Brooklyn.
American Pulley Co., Philadelphia, Pa.
American Watchman's Time Detector, 234 Broadway, New York.
American Engine Co., Bound Brook, N. J.
Adams-Bagnall Electric Co., Cleveland, Ohio.
Armington & Sims Co., Providence, R. I.
American Electrician Co., New York.
American Electrical and Maintenance Co., 451-453 Greenwich street, New York.
American Electrical Works, Providence, R. I.
Bullock Electric Co., St. Paul Building, New York.
Bossert Electric Construction Co., Utica, N. Y.
Baylis Co., The, 99 Cedar street, New York.
Bernard, E. G., Troy, N. Y.
Borne, Scrymser Co., 80 South street, New York.
Belknap Motor Co., Portland, Me.
Brewster Engineering Co., 27 Thames street, New York.
Crocker-Wheeler Electric Co., 39 Cortlandt street, New York.
C & C Electric Co., 143 Liberty street, New York.
Corey, R. B., 26 Cortlandt street, New York.
Coho & Co., H. B. 220 Broadway, New York.
Christensen Air-Brake Co., Milwaukee, Wis.
Card Electric Co., Mansfield, Ohio.
Cleveland Twist Drill Co., Cleveland, Ohio.
Crouse-Tremaine Carbon Co., Fostoria, Ohio.
Connecticut Telephone and Electric Co., Meriden, Ct.
Crown Woven Wire Brush Co., Salem, Mass.
Cook's Sons, Adam, 313 West street, New York.
Campbell Underground Trolley Co., Towanda, Pa.
Camp Co., H. B., Aultman, Ohio.
De La Vergne Refrigerator Co. (Hornsby-Akroyd oil engine), 138th street and East River, New York.
Diamond Electric Co., Peoria, Ill.
Diesel Motor Company of America, 11 Broadway, New York.
Edison, Thomas A., Orange, N. J.
Edison Electric Illuminating Co., Duane and Elm streets, New York.
Eddy Electric Manufacturing Co., Windsor, Ct.
Electric Storage Battery Co., Philadelphia, Pa.
Excelsior Electric Co., Brooklyn, N. Y.
Edison Manufacturing Co., Orange, N. J.
Edison, Jr., Thomas A., 96 Broadway, New York.
ELECTRICAL REVIEW, New York.
Electrical Engineer, New York.
Electrical Age Publishing Co., New York.
Electricity Newspaper Co., New York.
Fisher Foundry and Machine Co., Pittsburgh, Pa.
Fort Wayne Electric Corporation, Fort Wayne, Ind.
Fuel Economizer Co., Matteawan, N. Y.
Fostoria Incandescent Lamp Co., Fostoria, Ohio.
Fiberite Co., Mechanicsville, N. Y.
Fairchild & Sumner, 39 Cortlandt street, New York.
Gold Car Heating Co., Cliff and Frankfort streets, New York.
Harrison Safety Boiler Works, Germantown Junction, Philadelphia, Pa.
Highland Chemical Co., Connellsville, Pa.
Haines Co., Wm. S., Philadelphia, Pa.
Haring Steam Plant Equipment Co., 26 Cortlandt street, New York.
Ideal Electric Corporation, Thirteenth and Hudson streets, New York.
Imperial Porcelain Works, Trenton, N. J.
India Rubber and Gutta Percha Insulating Co., Glenwood, N. Y.
Jones & Son, J., 69 Cortlandt street, New York.
Johnston Co., W. J., New York.
Keuffel & Esser Co., 127 Fulton street, New York.
Kelley & Sons, B. F., 91 Liberty street, New York.
Keystone Electrical Instrument Co., Philadelphia, Pa.
Lawrence Machine Co., Lawrence, Mass.
Lewis Tool Co., 44 Barclay street, New York.
Lynn Incandescent Lamp Co., Lynn, Mass.
Morris, Elmer P., 15 Cortlandt street, New York.
Machado & Roller, 203 Broadway, New York.
Mowray & Co., P. M., 318 Broadway, New York.
Niles Tool Works Co., Hamilton, Ohio, and New York.
National Meter Co., 118 Chambers street, New York.
Nowotny Electric Co., Cincinnati, Ohio.
National Carbon Co., Cleveland, Ohio.
Nash Gas Engine Co., 99 Cedar street, New York.
New Britain Machine Co., New Britain, Ct.
New York Safety Steam Power Co., 30 Cortlandt street, New York.
Oswego Boiler Works, Oswego, N. Y.
Otis Electric Co., 38 Park Row, New York.
Onondaga Dynamo Co., Syracuse, N. Y.
Paragon Arc Lamp Co., Boston, Mass.
Peru Electric Manufacturing Co., Peru, Ind.
Peckham Motor-Truck and Wheel Co., 26 Cortlandt street, New York.
Partrick, Carter & Wilkins, Philadelphia, Pa.
Pelton Water-Wheel Co., San Francisco, Cal.
Paragon Motor Co., 39 Cortlandt street, New York.
Porter & Remsen, 39 Cortlandt street, New York.
Roebling's Sons Co., John A., Trenton, N. J.
Safety Insulated Wire and Cable Co., 229 West Twenty-eighth street, New York.
Stephenson Co., Ltd., John, 47 East Twenty-seventh street, New York.
Silex Insulation Co., 39 Cortlandt street, New York.
Sprague Electric Co., 20 Broad street, New York.
Simonds Manufacturing Co., Pittsburgh, Pa.
Sinclair D. J., Caledonia, N. Y.
Street Railway Journal Co., New York.
Translucent Fabric Co., Quincy, Mass.
Thomas & Sons Co., R., East Liverpool, Ohio.
United States Electrical Supply Co., 141 East Twenty-fifth street, New York
Vacuum Oil Co., Rochester, N. Y.
Van Horne, Burger & Co., Dayton, Ohio.
Worthington, Henry R., New York.
Walker Co., Cleveland, Ohio.
Weston Electrical Instrument Co., Newark, N. J.
Warren Electric Manufacturing Co., Sandusky, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.
Wendell & McDuffie, 26 Cortlandt street, New York.
White, J. G., & Co., 29 Broadway, New York.
Western Electrician, Chicago and New York.
Worthington Water-Tube Boiler, 30 Cortlandt street, New York.
Zimdars & Hunt, 127 Fifth avenue, New York.

Cables for the Omaha Exposition.

The Safety Insulated Wire and Cable Company, of New York city, announces elsewhere in this issue of the ELECTRICAL REVIEW that it will supply all the insulated wire and cable to be used in lighting the Trans-Mississippi Exposition, to be held at Omaha, Neb. The Safety company is also justly proud of the record made by its lead encased underground cable used for lighting the World's Fair grounds. This cable was taken up and was used satisfactorily for the same purpose at the expositions held at Nashville, Tenn., and Atlanta, Ga. The same cable will be used at the Trans-Mississippi Exposition. It speaks well for the quality of this company's product when a "Safety" cable will stand all the wear and tear of hauling in, drawing out and shipping, incident to four installations.

American Paper and Pulp Association.

The annual meeting of the American Paper and Pulp Association, which will mark its twentieth anniversary, will be held at the Waldorf-Astoria Hotel, New York city, on Wednesday and Thursday of this week. A number of interesting papers will be read, among others the following: "Electricity in Paper Making," by Charles F. Scott, chief electrician of the Westinghouse Electric and Manufacturing Company; "The Use of Electric Motors in Paper Making," by Dr. Louis Bell.

At the annual meeting of the Edison Electric Illuminating Company, of Boston, held on February 1, the following board of directors was re-elected: Walter C. Baylies, Henry B. Cabot, T. Jefferson Coolidge, Jr., C. H. Coster, George Dexter, C. L. Edgar, W. Powell Mason, Jacob C. Rogers and George S. Silsbee.

TOLD IN THE DYNAMO-ROOM.

The Saturday following Dick Harlow's visit to the plant, Benson, the engineer, came early in the afternoon to wash out the boilers, go carefully over engines and pumps and give the engine-room a thorough inspection all around, as was usual at the end of each week. As Jim always managed to be busy uptown on Saturday afternoons, and Bert had enough work cleaning and polishing the electrical machinery, Mr. Evans allowed Benson to hire an extra man, by the name of Dettmer, on these occasions. Dettmer was an ex-soldier and while he drew a small pension from Uncle Sam on account of having become a trifle lame in one arm, he nevertheless was able to do odd jobs around the town, and being by profession a carpenter, he was especially handy around the station, where he was universally addressed by his first name — Diedrich. Bert came in about one o'clock in the afternoon and found Diedrich busy letting the water out of the boilers, while Benson had taken down the connecting rod of one of the engines and was cutting some U-shaped liners for the crank pin end, which had been running rather warm for the last two nights.

"Hello, Diedrich! at your regular job again, I see," cried Bert as he came into the boiler-room.

"Yes, that I was, Mr. Edison," replied Diedrich, "and maybe you will lift me that hose down alreddy, so I can wash him oud good."

"Why, certainly," said Bert, uncoiling the hose and coupling it to the hydrant. "But how is Mrs. D.? She didn't bring my washing around this morning; I hope she isn't sick."

"Oh, I was joost going to tell you. Mine wife was sick sure enough with the rheumatics for some days alreddy, and she give the washing to that frau Mulligan, who lives the street across. It will be reddy this evening right away."

"Well, I'm sorry to hear your wife has the rheumatism," answered Bert, while he was filing some copper brushes to a proper bevel. "Is she taking any medicine for it?"

"No, nothing yet; I was up at Dr. Chase's house yesterday, fixing the alley fence, and he told me that electricitat was a mighty good thing for rheumatics," replied Diedrich. "Mebbe you know if that was so; eh?"

"Well, yes; electricity is a good thing for anything like rheumatism, and perhaps we could cure your wife right here," suggested Bert, thinking of the possibility of having some harmless fun with Diedrich and his wife.

"Is that so? Mebbe you want to cure mine frau so she will never feel those rheumatics again. Like they do mit those fellows that get electrocutioned in Sing Sing, don't it?"

"Oh, pshaw! no; you see they apply the regular dynamo current for that purpose, while we would only use what we call the static discharge," said Bert, in his most assuring manner. "You just bring Mrs. D. around this evening, say about 9 o'clock, when the heavy load is off, and we'll fix her all right."

"Well, I will mit her speak about it," replied Diedrich, who by this time had washed out the mud from the boilers and began replacing the manhole plates. Bert had stepped into the dynamo-room, where he, as well as Benson, was kept busy for several hours, after which both left to get an early supper before starting on the evening's run. Diedrich remained in charge, and was supposed to have the boilers filled and under steam by the time the engineer and Bert returned. Since natural gas was the fuel used at the Centerville plant, Diedrich's task, in spite of his little infirmity, was not a heavy one, and when, a little later, Benson and Bert returned, the steam gauge showed 80 pounds pressure.

"Now, don't be afraid to bring the patient over this evening," was Bert's parting injunction to Diedrich, as the latter was leaving the station.

"Say, Edison, I'm afraid that some of these days you'll get yourself and perhaps others into serious trouble," remarked Benson, as he gave one of the engines a little steam, "to warm her up," as he called it. "Now, what in the world are you scheming to do to that poor woman?"

"Why, just electrify her a little; it won't hurt her a bit, and, likely as not, it will knock the rheumatism out of her," laughingly spoke Bert.

By this time it was getting pretty dark and both men were kept busy, looking after the machinery, starting dynamos, switching in circuits, etc., until all of the generators and engines were fully loaded. As soon as everything was running smoothly, Bert began to make preparations for the coming exhibition of his skill as medical electrician. First he made a sort of platform, or dais, about two feet square and an inch thick, out of dry pine boards. In each corner he bored a hole large enough for a cross-arm pin, a glass insulator being screwed on each pin. This made a perfectly insulated stand, on top of which he put a common wooden chair, whose legs were also provided with glass insulators. The whole arrangement was placed near the driving belt of the alternator, which was the one usually carrying the all-night load. To one of the rungs of the chair Bert attached a piece of stout copper wire, extending to within about an inch of the edge of the belt. This completed the outfit and Bert, as well as Benson, who by this time had become equally anxious to have a little fun, eagerly looked for the arrival of the couple. They did not have long to wait, for a little before nine o'clock both made their appearance. After a little encouraging talk on the part of Bert, Mrs. Dettmer was easily persuaded to take a seat in the fatal chair. Bert meanwhile continued to extol the virtues of electricity as a curative agent, finally inviting Diedrich to grasp the patient's hand. By this time the chair and its occupant had become pretty well electrified, so when Diedrich's hand came within a couple of inches of his wife's, quite a powerful discharge took place, the suddenness of which so startled and frightened the woman that with a lusty scream she made a frantic grab for her husband. Doing so, she lurched towards him, the chair with its slippery legs slid from the platform, and tipping over struck the exciter belt, and the next instant darkness and confusion reigned. Mrs. Dettmer was screaming, Diedrich was shouting to her to keep quiet, and Meg, the dog, evidently wanted to be in it too, for she kept up a furious barking until Bert had struck a match and lit one of the gas jets that Mr. Evans had thoughtfully provided when the station was built.

The engineer meanwhile had shut down the engine and started up the other one, while Bert threw the proper switches, so that within a few minutes everything was in running order. Dettmer and his wife had made their escape before either Bert or the engineer had a chance to learn whether or not any harm had come to the couple. Benson looked quizzically at Bert, who was picking up the ends of the exciter belt and said:

"Edison, you take my advice; the next time you want to give an exhibition of your electro-medical knowledge, don't do it."

Mr. J. M. Hill, of Chicago, representing the Bryan-Marsh Company, was a New York visitor last week. Mr. Hill takes an active interest in the affairs of the Northwestern Electrical Association, and came East partly on matters relating to that organization.

Diversified Uses For Storage Batteries.

The very extensive application of chloride accumulators, manufactured by the Electric Storage Battery Company, is indicated by the large business being done by the company. The latest contracts cover batteries to be used in connection with electric elevators in the 30-story office building being erected on Park Row, New York, where 58 chloride accumulators of 3,500 ampere hours capacity will be installed; for the Cushman Building, New York, 118-320 ampere hour cells; the Dun Building, New York, 114-1,100 ampere hour cells. The State Mutual Life Assurance Building, Worcester, Mass., have contracted for an increase in their original plant. Very large plants are being constructed for the Chicago Edison Company and the Buffalo Railway Company. Chloride accumulators are being installed in the residences of Mr. John I. Waterbury, Morristown, N. J., and Mr. G. P. Morosini, Riverdale, New York. Also in Mr. Howard Gould's new steam yacht "Niagara," and Mr. Lloyd Phœnix's yacht "Intrepid." The American Fire Insurance Company's building in Philadelphia is being equipped with a battery for night lighting. The Germantown, Pa., Hospital, which has operated a battery of chloride accumulators for about two years, is increasing the capacity of its plant by 50 per cent. One hundred and eight cells, ranging in capacity from 400 ampere hours to 1,200 ampere hours, have been furnished to the Cleveland Telephone Company and the Southern Bell Telephone Company; 1,300 cells have been supplied for fire-alarm work at Portland, Ore., Augusta, Ga., and St. Paul, Minn. For telegraph work, the Lehigh Valley Railroad Company has ordered 208 cells; the Southern Pipe Line Company, 50 cells; the Great Northwestern Telegraph Company, 265 cells; the Chicago, Milwaukee & St. Paul Railway Company, 276 cells, and the Postal Telegraph and Cable Company, 220 cells. The General Electric Company have contracted for 112 cells of from 160 to 200 ampere hours' capacity; the Patton Motor Company and the National Electric Car Lighting Company are installing 432 cells in connection with their systems, and the State School of Mines, Colorado, has equipped its laboratory with 52 cells of 160 ampere hours' capacity.

Mr. Geo. A. McKinlock, president of the Central Electric Company, Chicago, visited New York city last week. Mr. and Mrs. McKinlock spent several days at Lakewood, N. J.

CANDLE-POWER OF A 10-AMPERE 45-VOLT ARC LAMP.

BY L. B. MARKS, M. M. E.

"What is the candle power of an arc lamp using 45 volts and 10 amperes?"

I shall assume that the correspondent who asked this question of the ELECTRICAL REVIEW had in mind a direct-current "open" arc lamp, such as is found in commercial service.

The energy consumed at the arc in this case is $10 \times 45 = 450$ watts. According to the ruling of the National Electric Light Association, "what is ordinarily known as a 2,000-candle-power arc lamp is one requiring on the average 450 watts for its maintenance." Conversely, the 10-ampere 45-volt lamp is what is ordinarily known as a 2,000-candle-power arc lamp.

But, although the rating adopted by the National Electric Light Association fulfills the specific purpose for which it was intended, it falls far short of settling the much-mooted candle-power question. Because a lamp consumes 450 watts, it does not follow that it will produce 2,000 candle-power, or that it will emit the same candle-power as another lamp consuming the same energy, even though the factors of the energy—namely, the current and the voltage of the arc—be the same in both cases. The candle-power produced will depend upon a great many conditions.

But, first of all it is important to decide on what particular candle-power is desired. There are at least five candle-power values, all materially different, any one of which might be given in reply to the original question. These are:

1. Nominal or rated candle-power.
2. Horizontal candle-power.
3. Maximum candle power.
4. Mean spherical candle-power.
5. Mean hemi-spherical candle-power (below the horizontal).

The 2,000-candle-power value plainly belongs to the first class. Although the second class, the horizontal candle-power value is used more largely in incandescent lamp measurements, it is also found in numerous instances, to the exclusion of the other classes, in arc-lamp photometric comparisons. The third value, or maximum, although ordinarily considered of much importance, may, if taken without the second, give rise to very misleading results. The fourth and fifth, on the other hand, though giving us mean values, often fail to supply the desired detailed information unless supplemented by the first and second. It would appear that to meet the present case, the mean hemispherical candle-power below the horizontal plane passing through the crater, is the most practical candle-power value, because only a very small percentage of the light is sent out above the horizontal.

But, whether we state only one or all of these candle-power values in giving the light measurements of a 10-ampere 45-volt arc, the readings are valuable only in so far as they tell the story of the performance of a pair of carbons of some particular *quality*. Thus, an arc lamp trimmed with certain carbons of domestic manufacture may give only a feeble illumination, whereas the same lamp trimmed with foreign carbons may give a very satisfactory light. Again, it makes considerable difference whether a solid (plated or unplated), or a cored carbon be used; with the latter a coloration of the arc affecting the light may be looked for. The importance of quality of carbon can not be overestimated. It is found that the mere substitution of one carbon for another in the same lamp may make a difference of over 80 per cent in the candle-power (mean spherical) produced, other conditions being the same. It is well known that when an arc lamp "hisses," the candle-power is greatly reduced. There are some carbons which, if operated at 10 amperes and 45 volts, would hiss. In a paper on "Arc Carbons and the Rating of Arc Lamps," read before the National Electric Light Association at Cleveland in 1895, I submitted a table giving the performance of 19 makes of carbons. Of these, eight brands hissed at 45 volts.

But, even though the quality of carbons be the same, the candle-power produced will depend largely on their *cross-section*. It is easy enough to see that the candle-power curve will be influenced by the shape of the carbon points, but the effect of diameter of carbon upon the light produced for a given current is often underrated. Schreihage found that ampere for ampere, within certain limits, the candle-power of homogeneous carbons of the same make varies inversely as the diameter. Although this law does not hold rigidly, it is serviceable in rough calculations. In this country, where the carbons are for the most part circular in cross-section and usually one-half inch (seldom under seven-sixteenths inch or over five-eighths inch) in diameter for "full" arcs, the difference in candle-power (mean spherical), due to the use of carbons of small or large diameter, may reach about 30 per cent. Naturally if the cross-section of the negative be less than that of the positive, as is sometimes the case, another variable element is introduced.

But, aside from the carbon question, there are still other important considerations. We must take our measurements at unit distance from the arc or at some other specified distance. We must know whether the candle-power measurements are corrected, photometer-room readings or values taken at the place at which the lamp is in actual service; in the latter case the effect of reflected light must be taken into consideration. We must also specify whether a globe be used, and, if so, its absorbing power. If a reflector be employed, as is the case in some lamps, the form of the candle-power curve will be materially altered. The shape of the carbon points, when the readings are taken, will also have an effect on the distribution. The influence of the surrounding atmosphere (temperature, humidity), is worthy of mention. This last consideration is, perhaps, of minor importance.

But, finally, even after we have gotten full information concerning all the above points, there are still two very important questions which must be taken into account before submitting a complete expression for the candle-power of an arc lamp consuming 10 amperes and 45 volts: First, the *personal error* in photometry; second, the *standard candle*. Regarding the first, it is well known that candle-power measurements are subject to the personal equation of the observer and that the total error becomes quite serious when two sources of light as widely different as the arc and the candle are compared. Nichols found that the personal error of 10 observers varied between (—) 8.7 and (+) 5.58 per cent. Adding to this the probable error due to difference in color, it is safe to say that 10 per cent would be a small figure for this discrepancy in ordinary arc-lamp candle-power measurements. As to the standard candle, it is necessary, in order to prevent ambiguity, to state what kind of a candle is used. There are three important standard candles: First, English; second, German; third, French. The powers of these three standards are to each other as 54:61:62, taking the Violle unit of light as 1,000. Thus if the candle-power measurements are given in English units they will be about 15 per cent larger than if given in French units. An example of the uncertainty arising out of the failure to name the candle-power standard occurs in Palaz's "Industrial Photometry" (page 249), where it is *assumed* that an investigator whose measurements are quoted and used in a comparative table, "had in view the German candle."

In conclusion, it need hardly be said that the term candle-power as applied to arc lamps is well nigh meaningless. Bearing in mind what has preceded, I shall submit without comment a few actual measurements, for what they are worth. The figures are culled from tests by Anthony, Thomas, Stine and Marks, respectively, and refer to arc lamps consuming practically the same current and voltage as the lamp under discussion. Following are the candle-power values:

CANDLE-POWER OF "2,000"-CANDLE-POWER ARC LAMP.

Nominal				2,000
Horizontal	227 (Marks.)	to	456 (Stine.)	
Maximum	1,080 (Marks.)	to	2,000 (Thomas.)	
Mean Spherical	425 (Marks.)	to	653 (Anthony.)	
Mean Hemispherical (below horizontal)			600 (Marks.)	

As to Swinging Pendulums.

TO THE EDITOR OF ELECTRICAL REVIEW:

Permit me to call your attention to an incorrect statement in your "Views, News and Interviews" column of issue of February 2, 1898.

Regarding the sympathetic swinging of pendulums, it is stated that the two *co-operate* and each *helps* the other. That this is not so is easily seen from the fact that *were* it true, a simple perpetual motion machine of ever-increasing power would be had.

If the writer of the item has ever seen the experiment tried, he may recall the fact that the second pendulum, which is started up by the first one, swings *opposite phase*, although in synchronism. In other words, as one pendulum swings toward you, the other is swinging away from you, and thus is *opposing* the motion that has set it in motion.

Regarding the moral lesson taught, I am inclined to think that it is not as desirable a feature as the writer mentioned seemed to believe.

Yours very truly,

F. C. SUTTER.

Swissvale, Pa., February 8.

ELECTRIC LIGHTING FOR PROFIT.*

BY ALEX DOW.

(*Continued from page 95.*)

The immediate business of an electric lighting station is to supply incandescent and arc lighting, and power for stationary motors.

Some small plants limit their business to lighting, and thereby avoid operating during the daylight hours. I think that this is often done without good reason. There is in nearly every village some demand for power, or such a demand can be developed by an enterprising manager. It is likely that the rates to be obtained for power will be very low, but if they will pay the additional cost of running the station during the daytime, and also carry some proportion of the standing charges, these low rates may be profitable indirectly by reducing the amount of standing charges remaining to be earned by the lighting business. It is certain that interest, insurance and taxes run for 24 hours a day, although the plant may only operate for 12, and if the power load will pay half of these items, in addition to its actual running cost, it is worth having.

Some stations do not run all night. The people in the village where such a station is located may go to bed early and may not use any appreciable amount of current after 11 o'clock or midnight. But I have always found it difficult to work up a good business in residence lighting, unless the plant undertook to give all-night service. Apparently customers do not care to have a duplicate lighting equipment in their residences. They do not fully appreciate the beauty of incandescent lighting, if it can not be switched on at any moment when it is wanted. People sometimes want lights between midnight and morning in their houses, and I suppose will continue to do so as long as our children come into this world with unreasonable ideas as to the part of the day in which they should do their sleeping.

I am sometimes told that residence lighting is unprofitable. It surely is, if every residence that is served requires an independent transformer, and if only one residence in a dozen takes current at all. The only way to do residence lighting at a profit is to do all the lighting, or nearly all that there is in a given residence district, and for this purpose the rate must be placed so that every possible customer can afford it. I have tried the experiment of low residence rates on a small scale more than once, and in each instance with success. It is to be tried now on a large scale in several stations, and I am certain that the experiment will be successful. The load factor of residence lighting is much better than the average load factor of many stations.

It is a serious handicap to a station when it is obliged to run two or three separate types of dynamos and to maintain two or three separate distributing systems for the supply of different shapes of energy. The best practice to-day is to furnish incandescent lights, arc lights, and electric-motive power from the same dynamos and same mains. This is a subject to be considered in the original plan of the station, but there are instances where old stations have been re-arranged with decided financial advantage. When a power load can be had, even at the low rates already spoken of, a study of the local conditions should be made, with a view to seeing whether a general distribution system will not be a source of profit. To design a new station with anything but such a system is almost criminal.

There has not yet been devised a satisfactory system whereby a supply of 500-volt current for railway work can be combined with a general lighting distribution. Therefore, a proposal that a lighting station should furnish such current must be dealt with as involving a new investment. This investment is always the cost of dynamo and switchboard, and usually the cost of an engine. The street railway evening load in Winter time coincides with the heaviest load on the lighting system for about 200 hours per annum. At all other hours the street railway demand is a desirable addition to the load on the boilers, and in most stations the dynamo and switchboard can be cared for without cost for additional help. If the boilers are properly designed to suit the conditions, they may be driven beyond their usual rate during these 200 hours with greater profit than would be possible if additional boiler capacity had to be installed. Furnishing street railway current appears, therefore, to be equivalent to the sale of steam to a special engine and the furnishing of attendants to an additional engine and dynamo, and it should be considered as a business proposition on that basis and not in the same manner as a demand for current from the electric lighting plant.

If street lights can be served from a general distribution system, the rate should be made in the same manner as the rate for any other service from that system. As street lights usually run about 4,000 hours a year, a rate made on a scientific basis will be very low in comparison with the rate for ordinary commercial lighting. This is not in accordance with the old practice of making all the profit of the business on a street lighting contract; but it is distinctly in accordance with the more modern practice, which will probably become general. Municipal contracts which can be performed without investment in special machinery are desirable business, in that the payment is prompt and absolutely secure; and that the conditions of their performance are clearly laid down in the original agreement. For that reason the tendency appears to be to take such contracts at a very narrow margin of profit.

But when the performance of a street lighting contract requires an investment of special machinery and the building of special lines, such a contract is usually undesirable business. It is impossible, under present conditions, to secure such prices for street lighting as will return the investment to the stockholders within the term of the contract. The contracts are usually short, and there is no security of their renewal. If, in dealing with a municipality, one were dealing with a business corporation having an established policy, it would be justifiable to take such chances; but our American cities, if they have a policy at all, change it from election to election; and no contractor can tell that the service which was deemed perfect by the board with whom he made his contract, will not be entirely unsatisfactory to their successors with whom he must make a new contract two or three years hence. In this respect we have another lot of educational work cut out for us. If we could make it clear to the mass of our citizens that the price for a year's street lighting depended on whether the street lighting plant would be employed next year or would be standing idle, we might have some chance to make close bids, without feeling that we were engaged in a risky speculation. The peculiarly exasperating part of the whole subject is, that those same theorists who object to asking for bids on a contract running more than two or three years, are usually ready to lock up the good money of the citizens in a city plant which has to be security for 30-year bonds.

In many localities there are opportunities whereby the power of a lighting plant may be employed in work which is not usually considered as part of the lighting business. An arrangement with a manufacturer whereby machinery required by the plant during evening hours will be used by the manufacturer in the daytime, is often possible. A similar arrangement is made in many places for the joint use of a water-power. The sale of exhaust steam for heating purposes is another source of revenue which is frequently neglected.

(*To be continued.*)

* Read before Northwestern Electrical Association, Milwaukee, January 19, 1898.

The Keystone Arc-Light Voltmeter and Ground Detector.

The Keystone arc-light voltmeter and ground detector, manufactured by the Keystone Electrical Instrument Company, of Philadelphia, combines in one instrument:

A voltmeter which will indicate the actual voltage of each circuit, or the total voltage of the generator, and consequently, the number of lamps burning, and a ground detector which will indicate a ground, determine its character and location.

It will indicate the character of the ground, its resistance and its location on the lines by taking three readings and equating them in simple formulas.

It can be used when the circuit is "alive," thus giving results under working conditions.

It replaces a cable-testing set which has proved extremely unsatisfactory, owing to the many microphone contacts in circuit.

It is self-contained, well made, accurate, reliable, dead-beat, unaffected by external fields or changes in temperature, easy and safe to manipulate, and low in price.

In connection with a set of switches and a battery of cells, or an ordinary incandescent circuit, it can be used to test the continuity of the line and the resistance from line to earth during the day, and for this purpose will be found much easier to handle, more accurate in results, and quicker in action than any galvanometer and bridge method.

It is believed that central station managers are commencing to realize the importance of the voltmeter in series arc station. It has long been the practice in even the very small isolated plants employing the constant-potential system, to install both a voltmeter and an ammeter; while as

yet but few series arc systems are equipped with more than an ammeter, which for this system performs practically the same functions as the voltmeter in the constant potential. It is, however, just as essential that the station manager or switchboard attendant should be able to read the passing load on the series arc system as on the constant potential, and this passing load can only be read by means of a voltmeter properly designed for that class of service. Many stations have attempted to employ a voltmeter calibrated to either 150 or 600 volts in connection with a multiplier, but such a device is far inferior to a voltmeter calibrated directly for the voltage employed. The Keystone arc-light voltmeter and ground detector has the advantage of being direct-reading and has no detachable multiplier box, taking up valuable space back of the switchboard and liable to be left out of circuit when high-voltage readings are taken. The instrument is constructed throughout to withstand the high voltage of the arc-light circuit without possible burning out or damage from defective insulation or poor connections. Combined with such a voltmeter an instrument possessing the advantages of a ground detector, by means of which a switchboard attendant can note the presence of a ground, and can also determine its character and actually locate it on the line, there is available an instrument which should meet with the unqualified approval of central station managers.

An idea of the general appearance of the instrument may be obtained from the illustration. It consists of a compound galvanometer system, mounted in a case which effectually shields the instrument from the influence of external fields. This case is finished in oxidized copper, well lacquered, and presents an attractive appearance. The scale is practically uniform from zero to maximum reading, indications are dead-beat, and the temperature co-efficient of the wire employed is so small that external changes of temperature make no difference in indications.

In setting up the instrument all that is necessary is to secure it to the switchboard by means of the lugs provided, taking care that the pointer stands at zero when no current is passing through the instrument. The blue printed sheet of instructions, accompanying each instrument, gives directions which are simple and explicit enough to enable any switchboard attendant to set the instrument up and operate it successfully.

In ordinary practice it will be found convenient to connect the central binding post to any ground connection available, as, for instance, the earth side of the lightning arresters, while the + and — posts may be connected to the spare cups on the board, there being nearly always available one such pair of cups provided for testing purposes. Then by plugging from these two cups into the terminals of any circuit on the board the voltage of this circuit may be read, and by dividing by the drop per lamp the number of lamps burning on the circuit may be ascertained. Then leaving the switchboard plugs in place, instrument plug 1 having been in receptacle marked — and instrument plug 2 in receptacle marked + leave instrument plug 2 in receptacle marked + and place instrument plug 1 in receptacle marked G, this will give the voltage of the ground on the + side of line. Then place instrument plug 1 in receptacle marked — and instrument plug 2 in receptacle marked G, this will give the voltage of the ground on the — side of the line.

Having obtained the three readings noted above, insert their values in the equation

$$N = \frac{A\,C}{D\,(A+B)}$$

In this equation N = the number of the lamps, counting out from the + terminal of the dynamo just beyond which the ground is located.

C = potential of dynamo or the difference of potential at the terminals of the circuit under test.

A = potential of ground on + side of line.

B = potential of ground on — side of line.

D = drop in volts for one lamp.

For example: Let A=100 volts, B=400 volts, C=1,000 volts, D=50 volts.

Applying the above formula,

$$N = \frac{100 \times 1{,}000}{50\,(100+400)} = \frac{100{,}000}{25{,}000} \text{ or } 4.$$

This means that the ground is just beyond the fourth lamp (counting out from the + terminal of the dynamo).

If the sum A + B = C, there is a dead ground; if the sum is less than C, the ground is partial.

This is evident from the fact that when the instrument is directly across the terminals of the circuit, it indicates the voltage of the circuit in the same manner as any ordinary voltmeter; but, when connected from either + or — side of line to ground, it reads the potential difference between that side of the line and the earth. If the ground is "dead," no resistance is in the series with the instrument, and the sum of the two ground readings must equal the total potential of the circuit, the voltage readings indicating the drop from the dynamo terminals to the grounded point. If, however, the ground is only partial, then the resistance of the ground is in series with the resistance of the instrument and acts as a multiplier, the multiplying factor being expressed by the term

$$\frac{C}{A+B},$$

and the employment of this factor in the equation gives the ground location when it is partial.

To find the resistance of the ground using the readings above:

Call R′ the resistance of the ground and R the resistance of the instrument;

$$\text{Then } R' = \frac{(C-A-B)}{(A+B)}.$$

To use this instrument for this purpose of testing lines during the daytime a set of switches is used, by means of which the connections can be readily made. These switches can readily be mounted on a portable switchboard if desired.

Now the deflection of the instrument is inversely proportional to the resistance in circuit, and so is the measure of the insulation resistance. Therefore, having obtained the first, the electromotive force on the generator, or the batteries, which we will call E, and knowing the resistance of the instrument, which we will call R, then denoting by V the voltage as shown by the instrument when the connection is made to ground on either + or — side, and by R′, the resistance between line and earth, we have the equation

$$R' = \frac{E\,R}{V} - R.$$

In practice it is not necessary to calculate the resistance for each observation, provided E can be kept constant, for a table can be readily made giving the value of the insulation resistance for any given deflection shown on the instrument. In practice it is well to employ a fairly high voltage for these tests, particularly in testing continuity of circuit, otherwise the line is liable to show open, from the fact that the resistance between the carbon points and in the lamp mechanism may be sufficiently great to show open circuit on low voltage.

As a precautionary measure, the instrument should not be left in circuit continuously across the terminals of the dynamo. It should be left idle, except during such time as is actually employed in testing.

It is not claimed that this instrument will locate every leak on a line when the general insulation of a line is poor. Such cases frequently arise on rainy days, when the cables are liable to have a small leak along their whole length, whether these cables be underground or overhead.

The presence of the ground, however, will be indicated, and if the ground at any one point is serious, its location can be exactly calculated.

Practical experience with arc-light lines and the use of such an instrument will, in a short time, teach the switchboard attendant just what deflections are dangerous and just what are allowable. By the use of this instrument, it is claimed, more testing can be actually accomplished from the switchboard and more definite results obtained than with any other form of testing device heretofore offered. The expense of patrolling the lines every day looking for possible trouble is entirely obviated. All that is necessary is that the night attendant should keep a log of any bad grounds he may discover during the night's run, and this report having been turned over to the "trouble man" in the morning, prompt repairs of defective insulation may be made.

THE KEYSTONE ARC-LIGHT VOLTMETER AND GROUND DETECTOR.

Thresher Electric Company.

Plans for a new factory are being made by the Thresher Electric Company, of Dayton, Ohio. The factory will be situated in the central part of Dayton, and within convenient distance of the Cincinnati, Hamilton & Dayton Railroad. It is the intention of the company to commence building by April 1, as under the present rush of business they have been compelled to employ a force of men at work day and night, and a much larger plant is necessary for the prompt execution of orders. They report the following large orders lately received: Four generators, of 120-kilowatt capacity, for the general post office at Washington, D. C.; one 110-kilowatt generator for the Methodist Book Concern, of Cincinnati, Ohio; three orders from the Brooklyn Navy Yard, New York, two 40-multipolar motors, and one 15-multipolar motor.

PUBLIC CONTROL, OWNERSHIP OR OPERATION OF MUNICIPAL FRANCHISES.*

WITH SPECIAL REFERENCES TO ELECTRIC LIGHTING.†

BY R. R. BOWKER.

(*Continued from page 70*)

Other American Cities‡—Philadelphia has a municipal water supply, started in the last century, which has long been its pride and has been considered very profitable to the city. But the figures apparently do not cover interest or depreciation on cost, which is indeterminate, one estimate being of $28,000,000. It started municipal gasworks in 1841; these have steadily degenerated until they became a notorious disgrace to the city, and in November, 1897, an ordinance was passed leasing the plant to the United Gas Improvement Company for 30 years. The municipal plant supplied about 60 per cent of the gas used, purchasing the rest from a private company at 37 cents per 1,000 cubic feet in gas holder. Last year there was manufactured about 5,000,000 thousand cubic feet, 3,000,000 of coal gas and 2,000,000 of water gas; the public lighting consumed 674,000 of this, 545,000 being for street lamps, and there was "unaccounted for," 1,132,000. There were 168,644 consumers on the books of the bureau. The annual report complained bitterly of the bad condition of the system, and of the difficulty of obtaining adequate appropriations for modernizing it. The price of gas has been $1 per 1,000 cubic feet, said to be of 19 candle-power, but the gas has been notoriously poor. The receipts in 1896 were $3,318,337, and a gross profit of $352,988 was reported. It is stated that $674,031 worth of gas is supplied free to the city. An accountant's report, however, shows $281,569 additional expenses, aside from interest on investment, improvement cost, etc., and he figures, including extension improvements, a net deficit for the past three years of $416,000 per year.§

Philadelphia's electric lighting companies are now for the most part consolidated in the hands of the Pennsylvania Heat, Light & Power Company, which includes the Edison system. There are in the city and suburbs 6,661 street arc lights at 30 to 37 cents per night, or $109.50 to $135.05 per year, costing the city about $800,000 yearly. The price of electric lighting in Philadelphia is on a base rate of three-quarters of a cent per 16 candle-power lamp hour, somewhat, but slightly, reduced by discounts. In 1894 a Committee of Councils, appointed to consider the establishment of a municipal electric plant, reported strongly against the plant.

Chicago was formerly supplied with gas by nine companies with at least three sets of pipes in some streets, of which eight have been consolidated in 1897 into The People's Gas, Light and Coke Company, originally organized as the Gas Trust Company in 1887, but blocked by legal proceedings until the consolidation act of 1897. The consolidated company has a capital stock of $25,000,000, on which it pays six per cent dividend, and a bonded indebtedness of $29,000,000 at five per cent interest. It has about 158,000 customers, consuming over 5,000,000 thousand cubic feet; its revenue, including by-products, is above $6,000,000. The city receives three and a half per cent on gross receipts, or at least $150,000 per year exclusive of city and state taxes. The price of gas, which was $2.50 in 1883, was made in 1893 $1.25 with a reduction of five cents per year, by which the price is now $1.

In electric lighting, the Chicago Edison Company has consolidated into it eight other companies, including all except four small companies still existing on the south side. The Chicago Edison Company (Nov. 30, 1897) has 6,000 customers, with 5,500 arc and 234,000 incandescent lamps and 7,400 horse-power in motors. The smaller companies south of Thirty-ninth street, show 2,500 customers, with 1,600 arc and 67,000 incandescent lights and but 45 horse-power in motors. Besides these there are probably 200 or 300 private plants, aggregating perhaps 8,500 arc and 200,000 incandescent lamps and 1,000 horse-power in motors. This shows a total in electric lighting of 15,700 arc and 500,000 incandescent lamps, the equivalent of 657,000 16-candle-power lamps and 8,445 horse-power in motors, in all nearly 900,000 equivalent. Chicago reported, 1896, 1,624 street arc lamps, of which 459 were supplied by private companies at $102.70, 59 at $137,50 and 116 from a municipal plant at $96.76. Oil chiefly is used by the gas companies; soft factory coal costs $1 to $1.10 at riverside factories. Chicago has no general subway system, but the conductors are underground except in the suburbs. The subway legislation requires that for new grants the consent of property holders shall be required for new subways as for new street railways.

Boston has been supplied with gas by the Boston and the Bay State companies in the city proper, and by five local companies in its suburban districts. All the Boston interests have been consolidated (December, 1897) in the New England Coke and Gas Company, with $17,000,000 stock and with $17,000,000 bonds. The two chief companies have paid 10 per cent and nine per cent dividend on capital of $4,500,000. The price of gas in Boston is now $1. Boston has its electric lighting chiefly from the Edison company, with $3,750,000 capital, paying seven per cent, and no bonds, and the Boston (high tension) company, with $1,700,000 capital, paying six per cent, and $1,062,000 bonds, besides which there are a suburban company of $174,400 capital, a small block plant company of $9,500 capital, and 200 private plants. The Edison company reports 1,541 arc lamps, 158,000 incandescent lamps and 6,109 horse-power in motors; the Boston company (1896), 2,193 arc lamps, 50,629 incandescent lamps and 1,468 horse-power in motors. The city lighting is supplied by the Boston company with 2,159 arc lamps, averaging 35 cents per night or $127.75 per year. The price of incandescent lighting is nine-tenths cents per 16-candle-power lamp hour, base rate, with lamps, subject to discounts; the average return for 1896 was seven-tenths cents for incandescent lighting. All these systems are under the control of the Massachusetts Board of Gas and Electric Light Commissioners, from which permission to increase capital, extend systems and organize new companies must be obtained, to which detailed annual report must be made, and by which a valuable annual report is issued.

Brooklyn obtains its gas supply from the Union Gas Company, a consolidation of five or more former companies. It obtains its electric lighting from the Edison company, which has consolidated with it the Citizens (high tension) company, and from two small companies in the Eastern District, besides private plants. A new Kings County Gas and Illuminating Company has recently been organized, with a view to electric lighting. The Edison company has a capital of $3,750,000, paying six per cent dividends, and bonds of $1,000,000, paying five per cent interest. The price of incandescent lighting is one cent, less discounts, for average consumption, and less additional discounts for large bills, bringing the average price below three-fourths cents per 16-candle-power lamp hour. Brooklyn has 3,200 street arc lamps, of 1,200 nominal candle-power, for the most of which it pays 34 cents a night, or $124.10 per year.

Toronto, Canada, should be cited as a city which has taken over the ownership of its street railway tracks, which it rents to the Toronto Railway Company, under a carefully drawn agreement, giving the city from 8 per cent up to 20 per cent of gross receipts and assures reasonable fares, special tickets being sold for workingmen's hours at 8 for 25 cents, and children's tickets for school hours at 10 for 25 cents. Ordinary tickets are 6 for 25 cents, while at Kingston, with a private company, the price is 8 tickets for 25 cents. Two years since, the municipality proposed to establish a municipal lighting plant, but it was voted down, and the gas system is operated by the Consumers' Gas Company, and the electric system by the Toronto Electric Light Company. The city makes a contract for street arc lamps each four years.

In 100 American cities of 30,000 population and over recorded by the National Electric Light Association, five have municipal plants; and of 450 smaller cities, 53 have municipal plants; or a total of 493 cities with private and 58 with municipal plants. The figures of price for street lighting for the standard arc lamp range from $64.75 in Dubuque, on moonlight schedule, and $68.52 costs (direct expenses only), all night, in Detroit's municipal plant, to a price of $156.95 in Fall River, Mass. The New York report shows prices to be $146, $164.25 and $182.50, nominally for 1,200-candle-power lamps; in fact, the first are the standard arc lamps registered elsewhere as 2,000-candle-power, the second are the same lamps under exceptional circumstances, and the third are pairs of lamps, not single lamps, supplied from the Edison system. The standard arc lamp using 450 watts in the arc (10 amperes supplied at 45 50-volts) is usually called a 2,000-candle-power lamp, but this in New York is rated officially as "at least 1,000 candle-power" and is entered in the National Electric Light Association reports as 1,200 candle-power, though in other cities counted 2,000, while the lowest standard lamp of 300 watts (6.8 to 7 amperes at 45 to 50 volts), in use in Brooklyn and elsewhere, is counted as 1,200 candle-power.

DATA OF COMPARISON.

The facts as to municipal industries in the chief cities and from the several countries show such range and diversity in method and results that conclusive generalizations are not easy. Each advocate can indeed find individual facts in defense of his own views. It is the usual device of socialist writers to emphasize the ills of an existing system, and to assume that in their new Utopia all would go well. This has been true of much of the argument for the municipalization of industries. The wiser course is perhaps to build from existing conditions, by eliminating the bad features and promoting the good features of an existing system, unless the evidence is conclusive that another system would be in all or in most respects better. In this belief I shall state my own conclusions from these data, and from my personal experience.

It is, of course, not more practicable to reconstruct existing systems altogether on these lines than it is to remake altogether an existing city in the light of present knowledge and modern methods. Yet Paris and other continental cities have been largely reshaped within this generation, and the trend of progress will

*From *Municipal Affairs*.

†This paper is written from the point of view of the economist and citizen, but with the data and experience gained as the executive of the New York Edison Company. To my mind, this should not involve opposition of interests; as he most serves his party who best serves his country, so he most serves the interest of a public service company who best serves the public. I mention the relationship, however, to forewarn readers of any unintentional bias. It is difficult for any, outside the business cited, in an academic discussion, to obtain real bases of comparison.

‡Lack of sufficient and reliable data compels the omission of detailed statements concerning Detroit.

[§ See the articles by Dr. Frederic W. Speirs and Col. John L. Rogers for a more detailed discussion of this subject.—EDITOR.]

be, I think, in the directions indicated. Nor would municipalization be possible with justice, except in view of existing conditions and investments. It is not just, for instance, that a municipality should take over private industries by right of eminent domain or legislative enactment at the appraisement value merely of the existing plant. The electric lighting industry, for example, though not yet 20 years old, has shown extraordinary development and changes, and a large part of its actual cost has been in patent rights, engineering expenses and replacements of machinery or distributing plant. Mr. Edison's original two wire underground system in New York has been entirely replaced by his improved three-wire system. To write off such replacements is not always practicable in industries which have not reached the paying point. Expenditures on this account are legitimately a part of the actual investment, and they must be taken into account if municipalization is not to mean confiscation. It should be repeated that a fair comparison between a private company and a municipal industry requires that the private company shall have, as in Berlin, the advantages usually associated with a municipalized industry.

(To be continued.)

Some Interesting Facts About Steel.*

The term steel signifies iron containing a small percentage of carbon, which may vary from less than 1 to 15 per cent.

In modern times steel signifies iron that has an infinitesimal amount of carbon in it, provided it is produced by the open-hearth or Bessemer process.

Meteoric iron is a close representative of nickel-steel, and was used by the ancients.

The majority of steel in the early times was obtained from wrought-iron.

Wrought-iron is produced from cast-iron melted in contact with iron cinder and iron ore, and when cooled and worked, again heated in closed vessels with shavings of horn and similar material.

The most important invention in connection with the production of steel was that of Sir Henry Bessemer, and termed the Bessemer process.

The Bessemer process dates back to the fifties. The essence of this invention was the production of steel from pig-iron by the use of an air blast. A blast of air is forced through the molten cast-iron so that the carbon and silicon contained in it are burned out, they forming the fuel. The converter in which the metal is treated by the Bessemer process is an egg-shaped vessel having a capacity of from several tons, which is turned on its side to receive the charge, and afterward brought into an upright position. Its bottom is full of holes, through which the air blast is forced.

Steel under the intense heat of a converter is as liquid as water.

In 1878 another great advance was made in the art by Mr. Sidney Gilchrist Thomas, by which ordinary grades of iron ore were rendered available for steel making. The Thomas invention related to the addition of a quantity of lime to the charge, and the lining of the converter with special bricks formed of lime, which absorbed the phosphorus in the cast-iron.

The slag obtained by the Thomas process is found to be rich in phosphorus, and is used largely as a fertilizer.

The Thomas improvement is the greatest yet made on the Bessemer process.

Following the Thomas discovery, the next important improvement in the process was that made by William Siemens in 1882, which consisted in burning the fuel so as to produce a gas which was burned in a peculiar furnace, obtaining thereby high temperature and great economy of heat.

The tenacity of good steel is very high, exceeding that of any other metal.

The fractured surface of steel generally presents a cyrstalline appearance, uniform in strength.

Much carbon makes steel close grained and lustrous.

Natural steel is obtained by refining cast-iron so as to deprive it of a sufficient portion of carbon to bring it to a malleable state.

Indian or Wootz steel is made by melting one pound of malleable iron in a crucible with 10 per cent by weight of the wood and leaves of the plant "Cassia auriculata."

Mild steel contains from two-tenths to five-tenths per cent carbon. When more is present it is termed hard steel.

Steel in its hardest state is too brittle for most purposes, and the requisite strength and elasticity is obtained by tempering, which is performed by heating it to a certain color, dependent on the use to which it is to be put, and cooling quickly.

The tensile strength of steel ranges from 75,000 to 96,000 pounds. The average is about 86,000 pounds.

A hemp rope 16.5 inches in circumference would be the equivalent in strength of a steel rope five inches in circumference.

*From *Digest of Physical Tests.*

United States Electric Plants For Malaga.

Under date of January 9, United States Consul Bartleman, of Malaga, transmits to the Department of State a newspaper extract which states that two companies have sprung into existence there to supply the demand for electric lighting in Malaga. "With a population of about 125,000, inhabiting some 20,000 to 25,000 houses or flats," adds the article, "it is evident that there is ample room for two works. One company is of German and the other of English foundation, identically as is the case in Madrid, where the two rival companies, working each on the same tariff, have so satisfactorily divided the business that they both made a profit of over £30,000 last year. Our concern at the moment, however, is not with the German, but with the English works.

"In one respect, the Malaga company gives a lesson to its English confrères, for it has adopted the principle of free wiring, with the result that it starts with a paying load at once, and has thereby placed itself in the position of being able to earn a dividend in its first year, instead of having to spend two or three years in pioneering, as in the case of almost every English concern.

"The capacity of the plant at present in operation is 330 kilowatts, and Messrs. Fowler & Company still have in hand under their contract another set similar to those in use, but the completion of this has been seriously delayed by the strike in the engineering trades. The great demand for electricity, however, has rendered essential the erection of further generating plants, and as the engineering strike in England has prevented the completion of English-made machines, the directors have had to place their orders in other quarters. They have arranged with the Westinghouse Electric Company, of Pittsburgh, to supply immediately two sets of plants, each of 135 kilowatts capacity, and these are now on the way to Malaga and will be erected early in the new year.

The total capacity will thus be raised to 765 kilowatts, and, in addition to this, we understand that the directors have under consideration the consulting engineer's estimates for two further sets of plants, each of which is to be of 300 kilowatts capacity.

"From this, it is very evident that the business in Malaga is making rapid strides, and that the undertaking will develop into a highly profitable enterprise. Of this we can have no doubt, and, if we had, it would be dispelled by the intelligence to hand from Malaga that up to the end of November last, after the works had been in operation for less than two months, upwards of 800 consumers had applied for a supply of electricity, and that 7,200 lamps were then connected to the mains. On the day when the supply was started, the maximum load was 16 kilowatts, and the output for the day only 29 units, but, by November 30, the load had reached 128 kilowatts and the output for the day had advanced to 884 units, while on December 11 148 kilowatts were recorded as the highest load and 1,093 units as the day's output."

The Sprague Motor Suspension Patent Case.

The decision in the case of the Sprague Electric Railway and Motor Company vs. the Union Railway Company, of New York city, and the Walker Company, is creating considerable interest. As the claims of the Sprague patent have been sustained by the court, they cover the mounting of electric motors, whose armatures are carried by the field magnet (and not concentrically by the driven axle), by sleeving extensions or arms from the field magnets of the motors upon the driven axle, and flexibly supporting the other end of the field magnet by a spring or flexible connection from the truck or car body.

Sprague's construction simplified the earlier methods of mounting, in which the motors were mounted upon a special supporting frame or platform which was an integral portion of the truck. In Sprague's case the field magnets themselves carry the armature, and are directly clamped at one end to the driven axle and spring hung from the truck at the opposite end. The motor thus was detachable, and its mounting much more compact and simple than before.

An injunction has been issued against the Walker Company, and an appeal has been taken from Judge Wheeler's decision, but the court refused to suspend the injunction against the Walker Company, although it allowed the Union Railway Company to continue to run the 10 motors it had already in use, but prohibited it from purchasing any more. An accounting has also been ordered to be made by both defendants.

ADVANCE INFORMATION

Electric Light and Power.

ROGERSVILLE, TENN.—H. J. Nelson, Mayor, may be addressed concerning proposed erection of electric light plant.

ALBANY, GA.—Mayor may be addressed concerning contemplated purchase of Albany Illuminating Company's plant and the expenditure of $5,000 on improvements.

CULLMAN, ALA.—Work on the electric light plant is expected to commence shortly.

COLUMBUS, OHIO—The Columbus Electric Light and Power Company's plant has been purchased by an Eastern syndicate of capitalists, who have assumed charge of it. The name of the new company has not been definitely decided upon.

HAGERSTOWN, MD.—The Washington County Electric Company has been incorporated by Christian W. Lynch, William Jennings, J. Clarence Lane, J. Irvin Bitner and William Hepperle. The company has applied for a franchise, and, if granted same, will erect lighting and power plant.

HOT SPRINGS, ARK.—City Clerk may be addressed concerning establishment of electric light plant.

SANDERSVILLE, GA.—The Mayor may be addressed concerning establishment of electric light plant.

DOWNINGTON, PA.—A $15,000 electric light plant will be established.

GRAFTON, W. VA.—The Council has voted to award the contract for the erection of a municipal electric lighting plant of 100 arc light capacity to the Fort Wayne Electric Company for $8,600.

KEY WEST, FLA.—The Key West Electric Light and Railway Company is making preparations to enlarge its plant and to rebuild the street railway.

MOUNT SAVAGE, MD.—The Cumberland & Pennsylvania Railroad electric plant will be enlarged, and electricity furnished to stores, churches and dwellings.

OREGON, MO.—An electric light and water plant will be erected, to cost $50,000.

WEST POINT, MISS.—C. W. Gibson may give information concerning the erection of an electric light plant.

BARRIE, ONT.—I. M. Wells, Mayor, can give information concerning erection of electric light plant.

DOVER, TENN.—A. M. Tippett is interested in a company which is being organized to construct an electric light plant.

ESSEX, MICH.—City Clerk may give information concerning the erection of an electric light plant.

GRASS LAKE, MICH.—City Clerk may give information concerning construction of electric light plant.

SANDERSVILLE, GA.—The Mayor can give information concerning the establishment of an electric light plant.

CHESTERTOWN, MD.—The Chestertown Electric Light Company is erecting the necessary building for its plant. The company was recently formed, with a capital stock of $15,000.

ST. ELMO, ILL.—The Southern Illinois Electric Light Company has been incorporated; capital stock, $20,000; incorporators, W. L. Stocker, G. W. Harlan and A. B. Johnston.

PONTIAC, ILL.—Livingston County Telephone Company, with a capital of $65,000, has been incorporated, to operate telephone exchange; incorporators, W. E. E. Herron, John S. Murphy, A. M. Legg.

New Telephone and Telegraph Companies.

BEEVILLE, TEX.—The Longshore & Wade City, Alice & Corpus Christi telephone lines have been connected at Beeville. The owners of these lines have also arranged to put in a telephone exchange at Beeville. It will be in operation by April 1.

MCGHEE, TENN.—J. B. McGhee may be addressed concerning company which is being formed to construct telephone lines.

CARROLLTON, OHIO—The Carroll County Telephone Company has been granted a franchise, and they will construct a circuit, with Carrollton for an exchange, with all the towns in the county.

MCCONNELLSBURG, PA.—Franklin & Fulton Telephone Company has been incorporated with a capital stock of $1,480.

MACON, MO.—The Macon Telephone Company has been incorporated by H. L. Gray, J. A. Hudson and Theo. Gray; capital stock, $10,000.

CARLYLE, ILL.—Clinton County Telephone Company has been incorporated; capital stock, $2,500; to construct and operate telephone system. Incorporators, G. Van Hoerbeke, J. C. Eisenmeyer, Thomas Ford, Otto Koch, W. S. London.

FLINT, MICH.—The Owosso Telephone Company has been organized with $20,000 capital stock.

MILWAUKEE, WIS.—The Eastern Wisconsin Telephone Company has been incorporated by citizens of Elkhart Lake, and has purchased the lines of the Sheboygan & Manitowoc County Telephone Company. The new company will extend the lines to a number of cities in Fond du Lac and Calumet counties.

ROCK CREEK, OHIO—The Warren & Niles Telephone Company has been incorporated, with a capital stock of $50,000. The incorporators are A. B. Conklin, Frank B. Ufer, C. W. DeVoe, Eugene Rawdon and E. J. Clapp.

GEORGETOWN, PA.—The Diamond State Telephone Company will build a line from this place to Lewis.

CENTREVILLE, TENN.—The Cumberland Telephone Company have finished their telephone line to this place, and have it ready for operation.

WESTMINSTER, MD.—The Westminster-Maryland Telephone Company will issue bonds for $8,000, to provide funds for extending its telephone lines to Baltimore city.

CLIFTON FORGE, VA.—The Clifton Forge Mutual Telephone Exchange has been incorporated, with William Patrick, president; N. C. Watts, treasurer; J. A. Sproul, secretary and general manager; capital stock, $5,000.

New Electric Railways.

CHICAGO, ILL.—An electric railway to be called the Cicero & Harlem Railway, has been incorporated with a capital stock of $1,000,000. The board of directors are: D. H. Lauderback, B. C. Stidgert, C. V. Weston, J. C. Moore and C. N. Whitehead. The organization purposes building a road from Cicero West to the Cook County line.

DAYTON, OHIO—The Dayton, Tippecanoe & Troy Electric Railway Company has been incorporated with a capital stock of $10,000.

WARREN, OHIO—The Trumbull Electric Street Railway Company has been organized. J. W. Packard, president; A. R. Silliman, vice-president; E. D. Kennedy, secretary and treasurer; C. S. Bidwell, superintendent.

SEATTLE, WASH.—First Avenue Railway Company has been incorporated with a capital of $150,000.

NEW BEDFORD, MASS.—Plans are being perfected for a new electric railroad from this city to Brockton, to be called the New Bedford, Middleboro & Brockton road. It is proposed to build first from this city to Lakeville, and to push the work of construction to Middleboro in six weeks.

LANSING, MICH.—The Lansing, St. Johns & St. Louis Electric Railway Company has now secured the entire right of way for the new line to be built next Summer.

CLEVELAND, OHIO—The Dayton, Troy & Tippecanoe Electric Railroad Company has been incorporated; capital stock, $10,000.

NEW YORK, N. Y.—Fort George & Eleventh Avenue Railroad Company has been incorporated with a capital of $10,000, to construct a road, to be operated by a motive power other than steam, 1,500 feet long on the boulevard.

PETOSKEY, MICH.—An electric road is to be constructed between this city and Harbor Springs, and also between Petoskey and Bay View.

New Incorporations.

ROCHESTER, N. Y.—Glazier Headlight Company has been incorporated; capital stock, $6,000.

PHILADELPHIA, PA.—The Chestnut Hill Electric Company, with a capital of $10,000, has been incorporated; directors, Robert J. Moore, Daniel J. McNichol, Samuel F. Clevenger, William Macdonald, William N. Topham, Edward White, Samuel W. Wray, Philadelphia.

PAINESVILLE, OHIO—The Central Electric Company, composed of prominent business men of this place, has just been incorporated with $10,000 capital. The purpose of this company will be the construction of telephonic systems and connections.

CHICAGO, ILL.—Electro-Medical Manufacturing Company has been incorporated; capital stock, $2,500; incorporators, C. O. Lindstrom, A. N. Lindstrom and O. B. Hjorth.

Increase of Capital.

CINCINNATI, OHIO—The Cincinnati Electric Company has increased its capital stock from $200,000 to $220,000.

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED FEBRUARY 1, 1898.

(*Concluded.*)

598,358 Electric circuit controller; W. T. Budds, Charleston, S. C.—An electric circuit controller comprising a wheel of conducting material, having peripheral projections of its body portion, and a plain segmental portion at one side of less length circumferentially than the body portion, and the wheel being cut away at one side of the segmental portion, the area of the cut-away portion being equal to that of the segmental portion.

598,410 Fire and burglar alarm system; C. P. Bostain, Milton, Pa.

598,489 Electric cigar-lighter; W. F. Kessler, Auburn, Ind.

GENERAL NOTES.

The Geneva Lake, Sycamore & Southern Railway Company has been organized with a capital stock of $150,000.

Mr. E. L. Beach, Chemical Building, St. Louis, who so successfully looks after the interests of the Commercial Electric Company in the West, has closed several nice contracts of late, a recent order coming from Ava, Ill., for a complete lighting plant; 220-volt generators will be used.

With the Emerson Electric Manufacturing Company, St. Louis, business is already pushing into the fan motor line, and, according to Manager Parker, the indications point to a larger trade than ever in the company's excellent breeze-producing products, several orders of 1,000 each having already been booked.

All friends of Secretary W. N. Mathews, of the St. Louis Electrical Supply Company, will regret to learn of that gentleman's rather severe illness, due to intestinal inflammation, from which he is slowly recovering. Meanwhile Messrs. Ruebel and Stanhope are working overtime to keep up with the unusual rush of orders.

J. B. de Lery's Incandescent Gas Light.

Dr. Joseph B. de Lery, well known in electrical circles, has been a student and investigator of the incandescent gas business for many years, and the result of his study has been the invention of a new incandescent light which burns with great brilliancy. Instead of using a mantle, he uses an incandescent material in small tassels and in varying numbers. In the sample burners, which are shown in his office at 44 Pine street, New York, there are 12 tassels, the gas generally striking them with a lateral flame and producing the incandescence in this manner. In one of his burners the light forms a crown, the tassels being in a circle above the gas flames. Should one or two of these tassels be destroyed for any reason, the user does not lose his light, but he simply places upon the rack new tassels, which will cost about 15 cents per dozen. The light burns without a chimney and does not need close regulation as to draft. Fuel gas can be used, it is said, with much success with this new burner.

LYONS & BISSING.

MR. JOSEPH LYONS, Electrical Expert and Solicitor, and *MR. GUSTAV BISSING, late Principal Examiner of Electrical Division A, U. S. Patent Office.* announce the formation of a partnership for the general practice of PATENT LAW, with its offices at the McGill Building, WASHINGTON, D. C.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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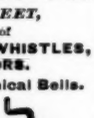

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During the past 60 days the number of advertisers in the ELECTRICAL REVIEW has increased *twenty-five per cent!* The new form of this journal evidently meets popular approval, not only of the reader—for its subscription list is extending every day—but of all who desire their announcements to reach every branch of the growing electrical field.

The Pennsylvania Electric Company, Marietta, Pa., are busily engaged in producing a full line of various types of telephones and will, in the near future, be prepared to furnish all kinds of high-grade telephones at the lowest prices consistent with the use of the best material and the most skillful workmanship. The demand for this company's "Crescent Ideal" telephone is large and constantly growing.

The General Electric Company, in view of the large number of applications made for information which is embodied in the second part of its recently issued Edison incandescent lamp catalogue, has published this information in a separate 16-page pamphlet of small octavo form. This information is of value to all users of incandescent lamps, and the General Electric Company will be pleased to supply copies of the pamphlet on application.

The New York & Staten Island Electric Company, in February, 1897, contracted for the installation of about 1,200 horse-power, Cahall-Babcock & Wilcox type of boilers in their power station. They shortly doubled this order, and now (just about a year later) have given the Cahall people a third order for boilers of the same type. The electric light people are extending their business in this territory, and the boiler manufacturers have reason to be pleased over this substantial recognition and endorsement.

The American Coffee Company, of Brooklyn, N. Y., are erecting a new power-house in connection with their plant, which is about 70 feet wide and 120 feet long. The power-house and boiler-house have brick side-wall construction and steel supports and roofing. Adjoining the boiler-house is a coal bunker about 20 feet wide, which carries the supply of coal in a steel bin about 30 feet above the ground. The whole plant has been designed with convenience and economy in view, and when completed will be a complete plant which can be economically operated. The contract for furnishing and erecting the steel framework of the building has been let to the Berlin Iron Bridge Company, of East Berlin, Ct.

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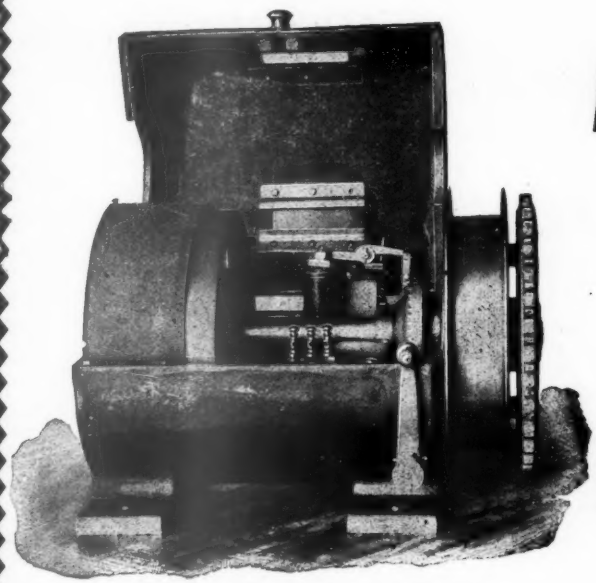

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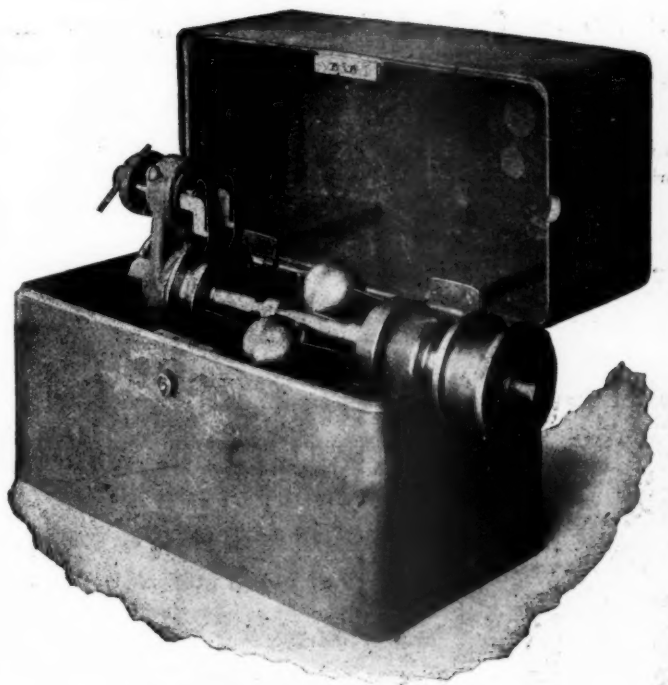

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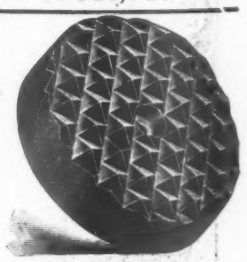

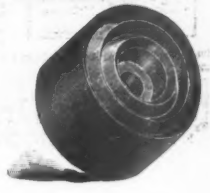

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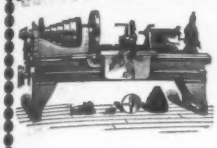

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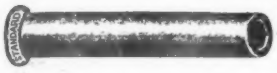

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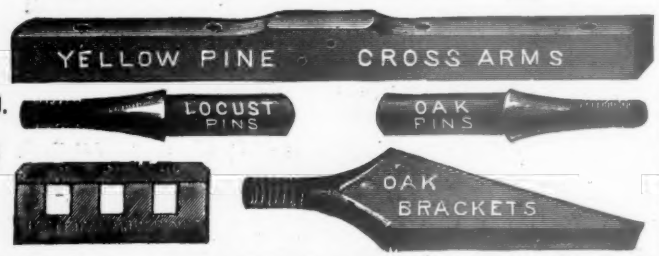

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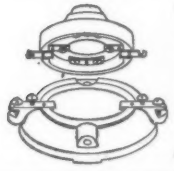

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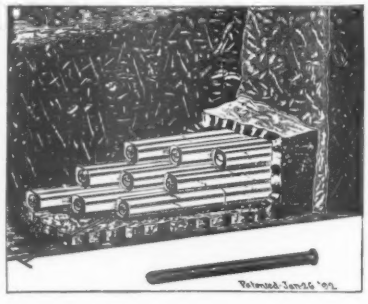

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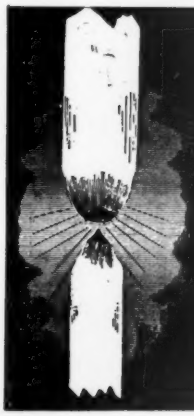

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